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VOLUME 26 NOVEMBER 15, 1937 NUMBER 23

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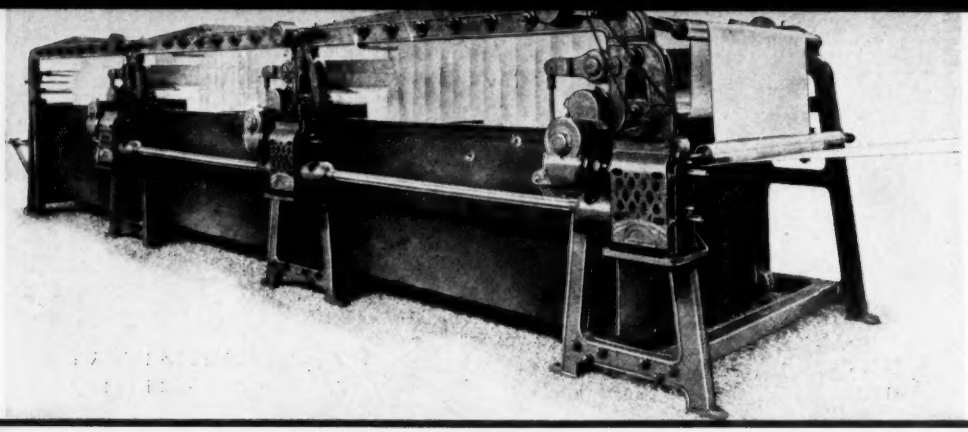

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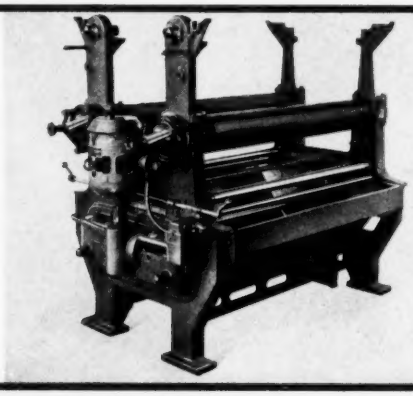

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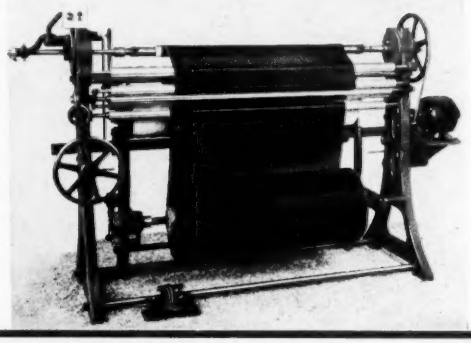

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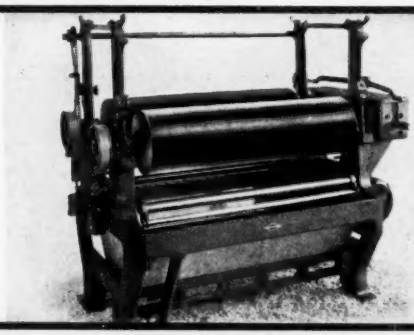

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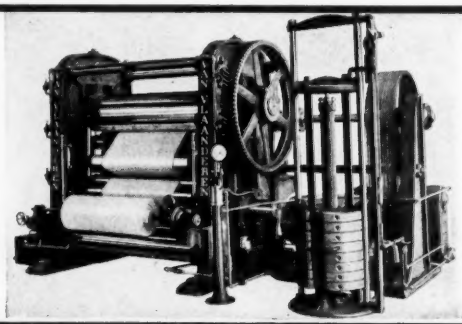

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Francis P. Garvan 709

Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable way research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

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AMERICAN
DYESTUFF REPORTER

VOLUME 26 NOVEMBER 15, 1937 NUMBER 23

Possibility of

Continuous Dyeing of Vat Colors

by the Pigment Method*

WILLIAM F. DEADY

IT IS generally conceded that the most satisfactory method of dyeing vat colors is by the so-called pigment or pad-jig method. That is when one considers fastness, penetration, uniformity of shade and the range of shades that can be dyed by this method. In dyeing piece goods by this method, the general procedure is to impregnate the goods with the pigment vat dyestuff, which has been very finely ground and dispersed into a colloidal solution, and squeeze evenly through nip rolls on a padder. The padded goods are then batched carefully at the back of the padder, from which point they may be taken directly to the jigs, or stored on proper benches or racks for a few days until the jigs are ready to handle them. In some cases the goods are carefully dried and re-rolled before jigging, especially if they are to wait any length of time between these operations. It might be stated that drying in between produces just a little better wash fastness, but this is not great enough with most colors to warrant drying for that reason alone.

In the jig a reducing solution consisting of the proper amount of hydrosulfite, caustic soda and wetting-out or foam-reducing agent is made up to the standard volume and temperature. It is also good practice to add at this point from ten to fifteen per cent of the pad solution, figured on the amount of this solution absorbed by the roll in its passage through the padder. In this way the excess pad liquor may be utilized and at the same time the amount of dye that washes off in the first end may be compensated for and a more uniform shade from one end of the roll to the other produced. The padded roll is then unwound from the shell, down under the guide rolls and reducing solution and wrapped around the beam on the opposite end of the jig. Before the second end is started the temperature is checked and brought up to standard. The correct temperature during the first two ends is very important to insure proper reduction of the dyestuff and its uniform distribution throughout the roll. The goods are given a third and a fourth end. Generally a patch is taken during the fourth end to check the shade and any necessary additions are made at this time. If the shade is OK one or two more ends are generally given to be sure the roll is thoroughly reduced and the two ends in fresh cold water are given to wash out hydro and caustic before oxidizing. The oxidation is carried out by giving two more ends in a warm solution of sodium bichromate and acid, hydrogen peroxide, sodium perborate or some other suitable oxidizing agent. The goods are then washed two more ends in warm water and are either soaped two to four more ends on the jig or batched up and removed to some other soaping machine. Of course, thousands of yards are finished without soaping, but for the full development of the shade and maximum fastness a good soaping is recommended.

As a general rule the dyeing, washing, oxidizing and washing requires twelve ends on the jig and figuring fifteen minutes per end, for a one thousand yard roll of four yard broad cloth, the total time would be about three hours. A production rate of about six yards per minute. Consequently, to turn out any volume of work a number of these jigs are required. Each jig being a separate unit, there is the possibility of slight variations in temperature, chemicals, manual handling, etc., which in turn gives rise to shade variations from roll to roll, even under the most expert supervision. The bulk of the goods is exposed to the surrounding air as the roll winds back and forth from beam to beam. Air is the arch enemy to the reduced dye during the dyeing operation, and is the cause of bad selvages, blotches, foam marks, etc., which gives the dyer so many headaches and causes so much extra work in rehandling. When you consider the length of time the reduced dye on the cloth is exposed to the influence of this oxidizing air during the jigging operation and the extremely short time the goods are in actual contact with

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the dyebath, it is plain to see why so much hydrosulfite is needed to keep the roll reduced. For example, take the previously mentioned one thousand yard roll of broad cloth which requires fifteen minutes to run from one beam to the other. This would be an average speed of about seventy yards or two hundred and ten feet per minute. The distance from the point where the cloth enters the dyebath and travels down under the guide rolls, to the point where it emerges at the opposite end, is approximately four and one-half feet. Two ends must be used to obtain a mean average of time a given point in the roll is actually in contact with the dyebath, which is about two and six-tenths seconds out of the thirty minutes running time.

This brings up the question of "Just how much actual dyeing takes place during the time the cloth is lapped around the beam?" This may be determined by taking a patch out of the first seam after it passes through the dyebath, but before it laps around the beam. Call this patch A. Take another patch from the same beam before it enters the dyebath during the second end, calling it patch B. Take a third patch C out of the same seam after it emerges from the dyebath at the opposite end of the jig. Take a fourth patch D out of the same seam in a manner similar to taking patch B. Continue patching in the same manner during the fourth end calling the patches E and F. Oxidize, soap and dry the patches and compare them. You will find very little difference in shade between A and B, but a marked difference between B and C. Very little difference between C and D, but D is deeper than E. The remaining patches will not show much difference on account of the bath becoming exhausted. The results of this test proves that the major part of the dyeing takes place during the time the cloth is in actual contact with the dyebath.

The following experiment may be carried out in an effort to determine how long a time the cloth shall be in contact with the dyebath to completely reduce the dyestuff and have it dye the cloth. Periods of one, two, three and four minutes may be used. Twenty-five yard pieces are taken out of the roll and folded down to one yard in length. Leaders are sewed on each side securely fastening the folded ends. A short bath of about thirty gallons is made up using the same proportions of chemicals as used in the regular bath, and the folded piece run back and forth keeping it in the bath as much as possible. After the allotted time the goods are washed, oxidized and soaped. Patches taken from these pieces were compared with patches taken from the roll treated in the regular way, and after a series of these experiments sandwiched in between regular work, it appeared that about two minutes was ample time for most colors to reduce and dye practically the same shade as the roll treated in the regular way. BCS Blue (C. I. 1114), on account of its slow reduction, did not come out as full a shade as the roll, but some of the newer relations of this color worked pretty well. The experiments are by no means complete because the writer has not had an opportunity to continue them. Further experiments using various temperatures and caustic strengths may prove even more satisfactory.

From the results so far obtained the writer believes pigment padded vat colors can be dyed continuously with the proper type machine. The present type machines used for regular continuous vat dyeing, contain booster boxes that are either too small to hold the required amount of cloth, so that a given point during the running would remain in actual contact with the dyebath for two minutes, or if made large enough to hold the required amount of cloth, they would hold far too much liquor, which in turn would not only be expensive, but would wash too much dye off the cloth before it had a chance to reduce and go back on the goods. Therefore the type of machine necessary would be one that could hold the maximum amount of cloth, open width, in the minimum amount of dye liquor.

Fig. 1 shows a sketch of just such a machine. This machine will hold one hundred and twenty yards of cloth full width, in approximately one thousand gallons of liquor, which if operated at a speed of sixty yards per minute, a given point will be entirely submerged for a period of two minutes. Faster or slower speeds may be used according to the reduction speeds of the various dyes used. Such a machine would be economical to use even for comparatively short runs per shade, and could be used just as well in dyeing vat colors by the regular method.

The cloth is saturated with the pigment color and evenly squeezed on the padder and then passes up and over roll 1, then down and under roll 2, then up and over roll 3, then under roll 4, etc., then at the end of this series of rolls its path is reversed and it returns under and over the other series as shown. It then passes through the squeeze rolls and after a short skying passes down and through the wash box as shown. Caustic and hydrosulfite are fed in to maintain a uniform dyebath, and the temperature is maintained by means of a controlled steam coil at the bottom. To reduce tension to a minimum the stainless metal guide rolls are set in ball bearings and the larger rolls at the top and bottom are driven by a chain and sprockets, which is also connected to the drive roll of the nip. The rolls and the squeezer are held in place by a well braced rigid framework preferably of stainless metal. In order to make this machine easy to thread-up, easy to clean and easy to inspect for worn bearings or any other parts that need repairing or replacing, the box may be raised or lowered by means of a cable hoist, similar to those used every day in automobile greasing stands. Conical expanders are also used to prevent wrinkles and double edges.

To get the most efficient removal of the caustic and hydrosulfite from the dyed cloth and at the same time the most economical oxidation of the color, the wash box is so constructed that each dip is a separate compartment arranged so the water sprayed at the nip flows back counter to the movement of the cloth. Near the top of each compartment is placed a suction pipe, which not only aids

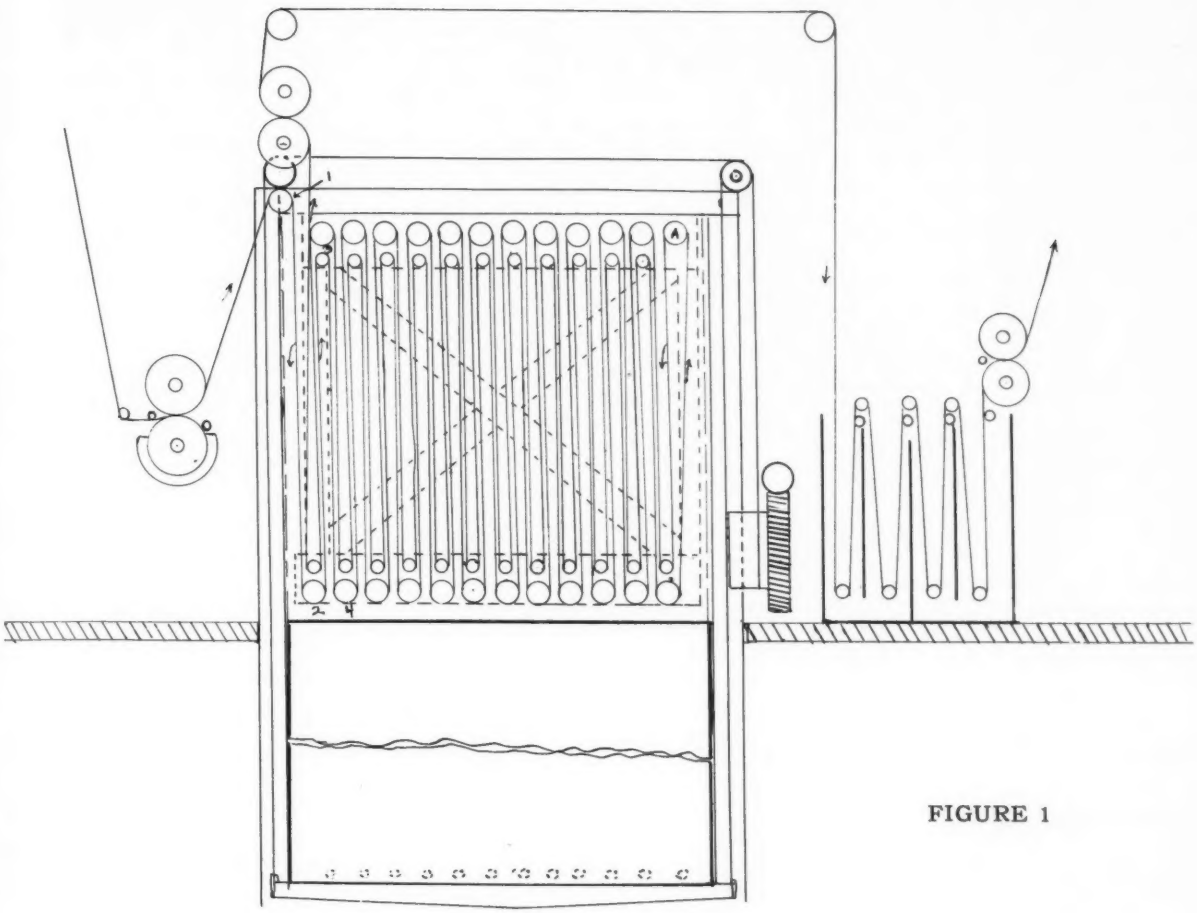

FIGURE 1

in effectively removing the chemicals, but draws air through the goods at the same time, which oxidizes the reduced coloring matter, making oxidation by chemical means unnecessary with most colors.

From the wash box the goods pass into a second unit similar to the one just mentioned for reducing, where they are given a good boiling soap. After the soaping the goods pass into a wash box of the same type as above mentioned for washing and oxidizing. From this point they are carried over a set of drying cans and the entire operation is complete in straight line production, with the least possible handling.

In summing up the advantages of a machine of this type for the continuous dyeing of vat colors pigment-method, regular reduced method, or for that matter in the dyeing of other types of colors, you have a machine that will hold more open width piece goods in less space, than any continuous dyeing machine in general use today. Floor space which is a vital factor in most dyehouses is reduced to a minimum. Straight line production, so successfully used in our automobile factories in reducing costs, can be carried out on this machine. Temperature and chemical control, weighing of chemicals and manual handling are concentrated in the one unit instead of in multiple units. Also economical use of chemicals and dyes, even for short runs per shade is obtained. This is especially true in the use of air as an oxidant during the washing instead of chemicals, which in turn give brighter shades and requires no secondary washing for removal before soaping. Colors which do not oxidize completely during the short washing and suction may be further oxidized by adding a small amount of sodium perborate or hydrogen peroxide to the soaping bath. The goods being entirely submerged in the dyebath, not only prevents premature oxidation, but also greatly reduces the amount of hydrosulfite necessary to maintain the dyebath in the proper working condition. Foam stains, so troublesome in regular continuous vat dyeing and jig dyeing, are practically eliminated.

The forward and reverse movement of the cloth keeps the bath in excellent circulation and tension is greatly reduced by driving the guide rolls as indicated and the use of ball bearings. Consequently many types of fabrics may be dyed, with less tension than they would receive in the average jig. Probably a pair of squeeze rollers, in place of roller A, as the cloth enters the reverse direction would be an advantage. Conical expanders placed in the proper places would prevent wrinkles and double edges. Many types of goods such as low quality broad cloths,

percales, sheetings, etc., which are now dyed regular continuous vat method with their reedy, poorly penetrated appearance, could be dyed just as cheaply pigment method on this machine with much better results. For large runs per shade two feed tanks of pigment color could be made up at a time and with the proper mechanical agitation, the dyer would not have to worry about the color over-reducing or going out of solution as he does if he attempts such a thing now, using the reduced method. Much heavier shades could be dyed also. The savings over the pad-jig method, in time, labor and materials as previously mentioned, would be very great.

From a mechanical viewpoint, the raising and lowering of the box by a cable hoist would make the machine easily accessible for threading-up, cleaning, inspection and repairs. The consumption of steam, power and water would also be much less than if the same quantity of goods were were to be dyed pad-jig method. Last but by no means least, the folding room would have less shading to do, the customers better satisfied, and the mill be enabled to meet competition at a profit.

—— ♦ ♦ ——

Physical and Chemical Textile Testing - V

JOHN H. SKINKLE*

PART I—PHYSICAL TESTING

(Continued from October 18, 1937 issue)

CHAPTER 6—FABRIC TESTING (Continued)

Porosity, Permeability, Waterproofing

SINCE these terms are variously understood, we shall start by defining them, also several other terms which are at present rather loosely used. Porosity is the amount of air space in a fabric expressed as percentage of the total volume of the fabric. Permeability is the ability of a fabric to allow a gas or vapor to pass through the fabric. A fabric is waterproof when it will completely resist the passage of liquid water through it; it is rainproof when it will resist the passage of water to a considerable extent, but not completely; it is showerproof if it offers only a moderate resistance to the passage of water. It will be seen that "waterproof", "rainproof" and "showerproof" represent different amounts of resistance to the passage of water or different degrees of waterproofness.

Porosity is determined by measuring the total volume of a fabric and calculating the total volume of fiber in the sample. The difference between these two values is air space and when calculated as per cent of the total volume gives the porosity. If we let

S = total volume of sample in cubic centimeters
F = total volume of fiber in cubic centimeters
A = area of the sample in square centimeters
W = weight of the sample at standard regain in grams
T = thickness of sample in centimeters
D = density of fiber in grams per cubic centimeter (Table X)
P = porosity in per cent

By definition $P = \frac{100\ (S-F)}{S}$

Also, $S = AT$ and $F = W/D$

Then $P = \frac{100\ (AT-W/D)}{AT}$

An example will show the calculations necessary. A cotton fabric 6 inches square gives an average thickness on the gauge of 11.0 thousandths of an inch (0.0110 inches) and when oven dry weighs 3.65 grams. What is the porosity? The English units must first be converted to metric units (Table VIII):

6 inches = 6 x 2.54 = 15.2 centimeters
.0110 inches = .0110 x 2.54 = .0279 centimeters

Then using the formula,

A = 15.2 x 15.2 = 231 square centimeters
T = .0279 centimeters
W = 3.65 x 1.065 = 3.88 grams
D = 1.50 (from Table X)

$$P = \frac{100(231 \times .0279 - 3.88/1.50)}{231 \times .0279} = \frac{100(6.45-2.59)}{6.45}$$

P = 59.8%

TABLE X

Specific Gravities of Fibers

Silk, raw	1.30–1.37
Silk, boiled-off	1.25
Wool	1.32
Mohair	1.32
Cotton, linen	1.50
Ramie	1.52
Hemp, jute	1.48
Viscose, cupra, nitro rayons	1.52
Acetate rayon	1.33
Asbestos	2.10–2.80

*Department of Chemistry, Lowell Textile Institute, Lowell, Massachusetts.

Porosity is valuable in giving an idea as to the permeability, warmth, and lightness of a fabric; although these qualities may be measured separately, they require special apparatus whereas porosity requires only a thickness gauge in addition to an oven and balance. Permeability is only roughly proportional to the porosity, the type of finish on a cloth having considerable effect on the permeability; for example, a cloth before and after felting might have the same porosity but after felting would be less permeable. The warmth of a fabric is due to dead air spaces in the fabric, so the most porous fabric would be the warmest provided that it is not, at the same time, too permeable; that is, that the air spaces are not too large. The lightness of the fabric is obviously proportional to the porosity since both qualities involve the weight of a given area.

Two types of permeability are of interest:

1. Permeability to air—desirable in clothing; undesirable in overcoating, sail cloth, balloon cloth, aeroplane fabric.

2. Permeability to water vapor—desirable in clothing, especially in underclothing; undesirable in materials to be used for coverings, such as tarpaulins.

Permeability to air may be measured by one of several methods:

1. By forcing air through a fabric at a constant rate and measuring the back pressure developed. Haven has described an apparatus for this purpose which, however, is rather complex and expensive.

2. By forcing air through a fabric at constant pressure and measuring the rate of flow of the air. Different forms of apparatus are described by Crawshaw, Clayton, and Gregory but all of these require rather elaborate apparatus and involve metering the air passed.

3. By forcing a known volume of air at a standard pressure through a fabric and measuring the time required. This method uses an apparatus called a Densometer which is simple to operate and which gives sufficiently accurate comparative results. A description of this apparatus and its manipulation will therefore be given.

The Densometer (Fig. 27) consists of a cylinder about 12 inches high with an orifice of definite diameter at the bottom, against which is pressed a companion orifice, the fabric being inserted between the two orifices. The cylinder is open at the top and contains an inverted cylinder slightly smaller in diameter than the outside cylinder, a tube runs from the top orifice nearly to the top of the cylinder. The annular space between the tube and the cylinder contains water (or better an oil of known viscosity) up to a definite level. To operate, the inside cylinder is raised, drawing in air, the fabric is placed between the two orifices, the inner cylinder is released, forcing the air out through the fabric. The time for the cylinder to fall between two rings marked upon it is noted (using a stopwatch) or an automatic timing attachment may be used. The greater the permeability of the fabric to air, the less time is required.

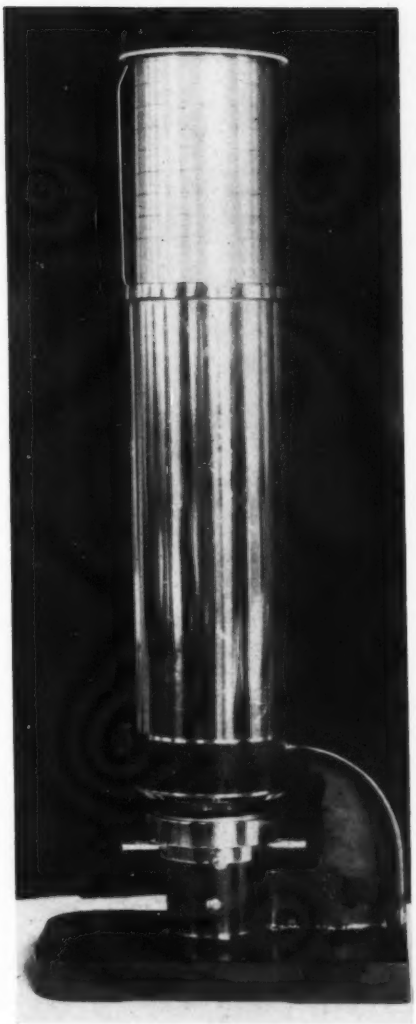

Fig. 27—Densometer

The permeability of a fabric to water vapor has been measured by three different methods:

1. By covering a vessel containing concentrated sulfuric acid with the fabric to be tested and exposing to a standard atmosphere for a definite length of time, then measuring the increase in weight of the sulfuric acid. This method requires considerable standardization to give comparable results.

2. By covering a vessel containing water at 37.5° C. (body temperature) with the fabric to be tested and exposing to a standard atmosphere for a definite length of time, then measuring the decrease in weight of the water. This requires even more standardization.

3. By covering a vessel containing water at any temperature with the fabric to be tested and exposing to any atmosphere for any convenient time but also exposing a similar vessel of water with no covering to the same atmosphere and for the same time. The permeability is then given as to the ratio (loss through fabric)/(loss from

open vessel). This method is much simpler than either of the others and is the one used by Black and Matthews in determining the permeability to water vapor of various underclothing materials.

Permeability to air has been suggested as a method of measuring the progress of the fulling operation; commercially fulled fabrics are 22 per cent to 59 per cent less permeable to air than the same fabric when unfulled. The use of this determination, then, might make a given degree of fulling more readily reproducible.

Before considering methods of measuring waterproofness we must note the ways in which water can pass through a fabric. These ways are:

1. By wetting the fabric, followed by capillary action which brings the water to the other side.

2. By pressure of the water, forcing it through the openings of the fabric.

3. By a combination of the above two actions.

If a fabric were made in which there were no openings between the yarns, the cloth might still allow water to pass, if it wet the fibers; this is what happens in closely woven duck or canvas. If a fabric of ordinary weave were made of fibers which had been chemically treated so that they would not be wet by water, the cloth would allow much of the water to roll off without penetrating but if the water gathered in a thick layer on it or if the water struck the cloth with much force, it would pass through the openings; this is the case of the so-called "showerproof" fabrics such as the cravenettes. The only way to completely waterproof a fabric is to fill the openings and coat the fabric with a substance which is not wet with water; this means using rubber as in ordinary raincoats, boiled oils as in oilskins, tars or bitumens as in tarpaulins, or waxes as in some tent cloths. These fabrics are also impermeable to air, and so are unsuitable for wear except in extreme cases. For ordinary wear, only a moderate degree of waterproofness is necessary ("rainproof" or "showerproof") combined with permeability to air and water vapor. Strictly speaking then, we are not measuring waterproofness but water resistance or water repellance.

The following are the methods which have been used for measuring water resistance; each type has been used in many variations but only one variation of each will be given.

1. Bag or funnel test.
2. Spray test.
3. Drop test.
4. Pressure test.
   a. Hydrostatic pressure test of the A.A.T.C.C.
   b. Box test of the A.A.T.C.C.

The bag or funnel test in its simplest form consists of a funnel placed in a graduate. A piece of the fabric is folded like a filter paper and placed in the funnel, water is poured into the fabric to a depth of four inches. If no leakage occurs in twenty-four hours, the fabric is waterproof; this is used to test canvas and tarpaulins. To test for water resistance of lighter fabrics, the amount passing through into the graduate in a definite time is measured.

The spray test is an attempt to imitate rainfall more closely; the method of Cook and Zaparanick is perhaps the simplest. A spray-head of 2½ inches diameter is connected to a one gallon reservoir of water in which a constant level is maintained; the reservoir is so placed as to maintain a constant head of water of 5 feet. The spray-head is clamped horizontally and a piece of the fabric 6 inches square which has been weighed to one milligram is placed on hooks to hang vertically 15 inches from the spray-head. The cloth is sprayed for one minute, the excess water scraped off with a knife edge, and the fabric is then weighed; the per cent increase in weight based on the dry weight is used as a measure of water resistance:

10% and under	= excellent
10% to 20%	= good
20% to 30%	= fair
30% to 50%	= partial
over 50%	= poor

The drop test measures the number of drops of a given size, falling on one spot, necessary to penetrate a fabric. The method of Cryer is given. The cloth is placed on a glass slide at an angle of 30° and with a piece of blotting paper beneath, a mirror is placed beneath to more readily see when the blotting paper shows dampness (paper containing water-soluble eosin may be used instead of blotting paper). A water reservoir is connected to a capillary of such size as to form drops of water of 0.06 cubic centimeters. These drops are allowed to fall 4½ feet, and at the rate of 60 drops per minute, onto the cloth. The number of drops required to penetrate the cloth and wet the blotting paper is counted. Six to eight drops represent a medium degree of water resistance, 40 drops represents a high degree of resistance.

Many types of apparatus for measuring the pressure required to force water through a fabric have been devised, the two most frequently used in this country are both standard tests of the American Association of Textile Chemists and Colorists—the hydrostatic pressure test and the box test. The hydrostatic test has the specimen clamped under a vertical well and water passing into a hydrostatic pressure reservoir to maintain a constant water level. The pressure reservoir is raised at the rate of one centimeter per second and stopped when the first drop appears on the top of the fabric. The reading of the head of water is then taken, the level is maintained at this pressure, and the amount of water collected in a given time is measured. Barr has shown that the appearance of the first drop is a poor criterion and that the appearance of the second drop gives more consistent results. A pressure of 17 centimeters or more indicates a fabric is showerproof; a pressure of 50 centimeters, that it is rainproof; if it stands 50 centimeters for one hour, it is waterproof.

The box test (Fig. 28) requires less elaborate and expensive apparatus. A box with an open side of 4¼ x 20½

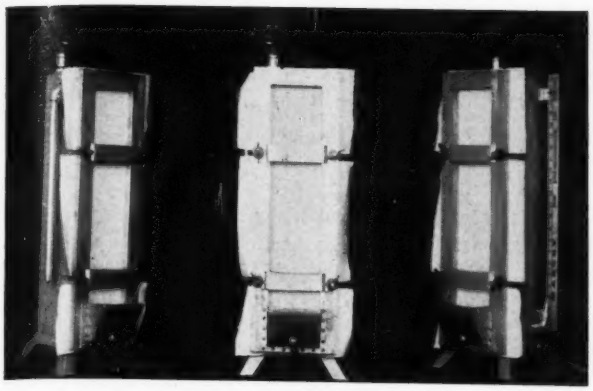

Fig. 28—Apparatus for Measuring Waterproofness by Box Method

inches is used. A specimen 7 x 24 inches is cut out and clamped over the open side; a graduated cylinder is placed below the drain tube to collect the water passing through the fabric. The box is filled with water in one minute, a stop watch being started when the water level reaches the overflow. The minimum pressure in inches of water at which leakage occurs and the amount of water coming through are observed at intervals of time (1, 10, 20, 60, minutes). The minimum pressure is the depth of water from the water level inside to the highest point on the cloth at which a drop appears on the outer surface of the cloth, a linear scale on the clamping frame being used to measure the depth.

In evaluating the water resistance of fabrics, the effect of laundering and use should also be considered. Smith has devised an apparatus which gives an accelerated ageing of the fabric and enables one to predict how the cloth will behave after use. An example of the effect of laundering on results obtained with a box test on two fabrics is shown in the following table:

	Minimum pressure in inches of water			
Sample	1 *min.*	5 *min.*	10 *min.*	30 *min.*
A	12	10½	10½	10
B	12½	9½	9½	8½
After first laundering				
A	10½	10	9½	9½
B	9	8½	8½	8½
After second laundering				
A	9	7½	7½	7½
B	9	8	8	7½

In this case, sample A was originally superior to sample B, but after two launderings, the two samples were the same.

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Absorbability and Wetting-out

Absorbability and wetting-out both refer to the entrance of liquid into a yarn or fabric; absorbability is the ability of the fabric to take up a liquid; wetting-out is a technical term applied to the ability of a liquid to enter a fabric and displace the air from the capillary spaces. Both terms refer to the same phenomenon but absorbability refers to the fabric and wetting-out to the liquid. Two factors are important in absorbency: the total amount of liquid absorbed, and the rate of absorption of the liquid. Sometimes one factor is measured and sometimes the other.

The methods used in testing fabrics for absorbency and wetting-out agents (or penetrants) are:

1. Surface tension—this does not take capillary action into account and so is not always comparable with practical results. For the determination of surface tension see any text on physical chemistry or colloid chemistry.

2. Sinking time of a tuft of fiber or yarn or a patch of cloth—results obtained by this method are likely to be erratic.

3. Draves' method—a standard method of the A.A.T.C.C.

4. Capillary travel method—measures the rate of absorption, not always comparable to results obtained in practice.
   a. Weireck method.
   b. Haven method.

5. Absorption from a wet solid surface such as a wet brick or tile—measures the total absorption.

6. Absorption on immersion in a liquid—measures the total absorption. The excess water may be removed:
   a. By allowing to drip for a standard length of time.
   b. By blotting.
   c. By centrifuging—method of Lenher and Smith.

These last five methods will be considered in more detail.

The sinking time of a patch of cloth is a test very often carried out in the industry because it is simple to do, requires no special apparatus, and is quick. The results, however, may be erratic and are never comparable with tests carried out by another operator or even with results by the same operator at different times. The usual method of testing is to place the liquid in a series of beakers; the fabric is then cut into a number of equal sized squares (1½ x 1½ inches). The test consists of dropping a square on the surface of the liquid (preferably from a standard height) and measuring with a stop watch the time required to sink. The watch is started when the fabric

strikes the surface and is stopped when the last corner sinks below the surface.

Draves' method, which is a standard method of the A.A.T.C.C., is an elaboration and improvement of the above; it measures the time required for a standard skein to sink in a solution of wetting agent when the skein carrying a standard weight is held below the surface of the wetting solution by an anchor. The sinker consists of a two-inch length of No. 12 copper wire bent into the form of a hook; the weight of the sinker should be 1.5 grams. The sinker is fastened by a fine strong thread at a distance of one inch from an anchor which should weigh at least 20 grams. A 5-gram skein of gray two-ply cotton yarn is folded once to form a loop, the sinker and anchor are attached, and the opposite end of the skein is cut through with shears. The wetting solution in a 500 cc. graduated cylinder is brought to 25° C. and the skein dropped in. The time elapsing between the entrance of the skein and the moment when the weighted skein starts to sink (when the thread between the sinker and anchor slackens) is measured with a stop watch; the average of at least four tests should be taken. Wetting agents are tested in concentrations of 1, 2, 5, 7, 10, 20 grams per liter and the results plotted. Different wetting agents are compared by determining the concentrations which will give a sinking time of 25 seconds. If the method is to be used for testing yarns or fabrics for wetting-out, a ½-gram sinker should be used since the 1½-gram sinker is too heavy for samples which wet-out readily.

Two capillary travel methods have been used—Weireck's method and Haven's method. The method described by Weireck for testing towelling uses strips of fabric 8 inches long and one inch wide, cut both warp-wise and filling-wise; water soluble eosin is applied to the strips very sparingly to serve as an indicator. Each strip is pinned over a horizontal rod supported at a convenient height above a beaker of water so that the end is just above the surface, a steel rule is clamped parallel with the vertical edge. The strips are lowered so that the end just touches the water and the stop watch is started. The height to which the water rises in 1, 5, 10 minutes is recorded. The following table is given for rating the fabric as to absorbency:

At end of 10 *minutes if water rises*	*Rating*
5-6 inches	Excellent
4-5 inches	Very good
3-4 inches	Good
2-3 inches	Fair
1-2 inches	Poor
0-1 inch	Very poor

Haven's method also measures the rapidity of absorption. Strips of cloth one inch wide are cut from selvage to selvage, these strips are held horizontally over the ground glass top of a light box with a scale alongside. The tension in the strips should be made uniform by attaching standard weights at one end. The weighted end is allowed to dip into a tray of water and the position of the water in the strips is read at various time intervals. A plot of capillary travel against time is prepared and used in rating the fabrics for absorbency. Hess and Reidheimer have shown that to get reproducible results a constant relative humidity and temperature are necessary in the Haven method.

The total absorption from a wet brick or tile surface may be measured by weighing the fabric before and after the test. The brick or tile should be kept wet by immersion in water and the fabric should be in position long enough to come to equilibrium. This test is said to be independent of relative humidity conditions.

The amount of liquid absorbed when the fabric is immersed in the liquid may also be measured by weighing before and after. Haven suggests a simple method which consists in cutting out a sample three inches square with a template, conditioning and weighing, immersing in the liquid to a depth of three inches by means of tweezers, and holding the fabric immersed for two minutes. The sample is then withdrawn, allowed to drip for 15 seconds and weighed in a tared glass weighing bottle.

Lenher and Smith's method is more elaborate than the above. A five-gram skein (or sample of fabric) is weighed to the nearest centigram and sunk as in the Draves' method for 15 seconds. It is then dumped into a slowly revolving centrifuge with a basket radius of 5.5 centimeters, the centrifuge is then rotated at a speed of 2,160 revolutions per minute for 15 seconds, the sample is reweighed and the per cent increase in weight determined. An average of five determinations should be obtained.

If a centrifuge is available, Lenher and Smith's method is the best one for total absorbency. Draves' method is probably the best one for rate of absorption or rate of wetting. For rough but quick and simple determinations the sinking time method, Weireck's method and Haven's total absorbency methods are available.

In testing wetting-out agents or penetrants, the rate of wetting is all that is required; but in testing a fabric for absorbency both rate of absorption and total absorption should be determined since a towelling, for example, might absorb water very rapidly but not hold very much or, on the other hand, might absorb a large amount of water but take it up too slowly to be of value.

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Shrinkage

Shrinkage is the linear amount a fabric will contract warp-wise or filling-wise when laundered. It is expressed either as per cent of its original measurement or as inches per yard. All fibers have some tendency to shrink but this tendency is greatly increased if the fabric has been stretched in finishing; a stretched fabric will lose all its stretch when laundered. Standard tests are available for testing cotton, rayon, and silk fabrics for shrinkage, but wool fabrics, which shrink the most, have no standard test as yet; this is probably because the shrinkage of wool is affected by so many variables whereas the other fibers have a less complex action.

Johnson has shown that shrinkage in cotton goods is nearly totally accounted for by the water; that is, that the detergents used have little effect on the amount of shrinkage, but in spite of this fact the standard tests imitate real laundering as far as chemicals used are concerned. It should be borne in mind also that shrinkage is not complete in one laundering; although most of the shrinkage occurs in one treatment, a total of at least five launderings are necessary to get the total shrinkage.

All the standard tests involve the preparation of a sample by cutting a square of cloth and marking it either with indelible ink or with fine threads sewn into the fabric. The marks are made a measured distance apart both warp-wise and filling-wise, three pair in each direction. The samples are then laundered by varying methods which will be taken up later.

After laundering and rinsing the fabrics are dried on a horizontal surface and pressed while still damp by a flat-bed press or by a flat-iron, used without sliding to imitate a flat-bed press. The distance between marks are then measured and averaged and the resulting shrinkage expressed as per cent of original measurement or as inches per yard. Flat-bed presses suitable for use in these tests may be obtained in this country from General Electric Company, Schenectady, New York, or from Franklyn Press Company, Syracuse, New York.

The A.A.T.C.C. method for shrinkage of cotton fabrics, which is also the accepted method of the A.S.T.M. and the U. S. Dept. of Commerce, uses a sample at least 20 inches square, or better 20 inches long and the full width of the fabric, and a measured distance of 18 inches. The washing machine is a reversing wash wheel of 20 inches diameter, a capacity of 3 pounds of dry cloth, and fitted with a pipe for injecting live steam into the wheel for heating. Machines which answer these specifications may be obtained from Robert Ewing & Sons Company, Green Island, New York, or from Hurley Machine Company, 22nd Street and 54th Avenue, Chicago, Illinois. The machine is used with a full load and with solution equal to 50 times the weight of the load. The solution used is one of chip laundry soap such as will give "good running suds" and is made up from a stock solution of one pound of soap in a gallon of hot water. The load is put in, the machine started, and water and soap at a temperature not exceeding 100° F. is added; the temperature is raised to 212° F. by injecting live steam, the steam is then shut off and the machine is run for 40 minutes. The soap solution is drained off, water is run in, the temperature is raised to 140° F. and run for 5 minutes. The water is drained off, more water is run in, raised to 140° F. and run for 10 minutes. The water is drained off again and the load is run without further additions of any sort to complete the full cycle of 60 minutes, during all of which time the machine should not be stopped. This test duplicates very closely actual laundry conditions but requires special and rather expensive apparatus; it is suitable for laboratories doing a lot of shrinkage testing but another method requiring no special apparatus would be desirable for laboratories making only occasional tests.

The A.S.T.M. method for use on silk and rayon woven goods uses a sample 12 or 13 inches square and measured distances of 10 inches. The soap solution used is 0.5 per cent neutral soap and the washing and rinsings are all done at 100° F. The machine used is a Launderometer, originally devised for obtaining the fastness of dyes to laundering and which consists essentially of a number of one-pint preserve jars held with their bases to a horizontal shaft 2 inches from the center of revolution, the shaft revolving at 40 to 45 revolutions per minute. The jars are maintained at the standard temperature of 100 ± 2° F. by a water bath. Each sample is placed in a jar with 300 cc. of soap solution and run for 15 minutes. The sample is removed from the jar, rinsed by dipping in three changes of water, returned to the jar with 300 cc. of water and run for 5 minutes; it is then dried, pressed, and measured. This test requires only a Launderometer which can be used for other tests; the Launderometer may be obtained from Atlas Electric Devices Company, 363 West Superior Street, Chicago, Illinois. The Launderometer might be used for testing all fabrics for shrinkage, using the same treatments as are specified for fastness to washing tests for dyes on the same kind of fabrics.

Williams has suggested a method of testing for shrinkage which requires no special apparatus. A sample 10 inches square with measured distances of 8 inches is used; the sample is first washed in warm water if any significant amounts of sizing are present. The sample is then immersed in a beaker containing 0.3 per cent solution of soap in water at 40° C. and the beaker and contents are left in a warm place for at least two hours. The sample is removed, rinsed, squeezed as dry as possible in towels, allowed to dry while spread smooth on a pad of cotton sheeting, and ironed. Measurements are taken and the results reported as "ironed dry." The sample is rewet, wrung out, ironed until dry, conditioned several hours, measured again, and the results reported as "ironed wet." The ironed dry shrinkage is usually more than the ironed wet.

The permissible amount of shrinkage varies widely ac-

cording to the use to which the fabric is to be put and the labelling which goes with it. A "guaranteed shrink-proof" or "100 per cent shrink-proof" fabric should have no appreciable shrinkage; a "pre-shrunk" fabric should have only a small amount of shrinkage (1-2 per cent). In general, we may say that in any fabric a shrinkage of more than 5 per cent in either direction is excessive.

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(To be continued)

Fire-Proofing Fabrics*

Some Recent Developments and Suggestions

ONE of the most disastrous concomitants of modern warfare and the aerial bombing of towns, is the fire danger which follows the use of incendiary bombs. These bombs contain a thermite mixture and when once started burning they resist all usual methods of fire extinction. That the problem of extinguishing incendiary bombs having a thermite charge has not escaped the attention of investigators on the Continent is shown by German Patent 622,219, which recommends the application of a mixture of dry sand and anhydrous potassium bisulfate to the affected regions.

Chlorinated diphenyl is a very satisfactory fireproofing agent for wood and fabric, yet very little attention appears to be paid to it. When diphenyl is chlorinated, the product becomes progressively more viscous as the percentage of chlorine increases. When 19 per cent has been taken up, the resultant material is a liquid, but higher proportions of the halogen give rise to more viscous fluids and finally a solid is obtained.

It has been stated that the cost of fireproofing wood with chlorinated diphenyl is comparatively low, and that the wood treated is stronger and without the lifeless appearance which some fireproofing methods render it. Chlorinated diphenyl, moreover, is practically odorless and tasteless, stable to alkalies and to prolonged heating. It is soluble in many organic solvents, but insoluble in water and glycerine.

For the protection of cotton and cellulosic fabrics from fire, innumerable salts have been recommended and used in the past. Potash alum is suggested in old formula books and is said to have been used by Montgolfier in connection with his fire balloons. Ammonium phosphate is another salt frequently mentioned. In order to produce a permanent finish various two-bath processes have been used in consequence of which insoluble oxide of tin, or other material is precipitated within the fiber. A mixture of borax and boric acid is said to be a very satisfactory proofing preparation, but suffers from being readily soluble in water, and therefore too easily removed, for instance, by the fire hose.

The presence of a heavy loading of salts in a fabric is not desirable from the point of view of softness and draping qualities, yet too often the fire-resistant effect is so slight that unless high proportions are used, the material is not effectively proofed. Again, the employment of acid salts like aluminium, ammonium and magnesium sulfates on cellulosic fabric is not to be recommended, on the grounds that hydrolysis is liable to take place with the development of free acid and a resulting tendering of the fabric. From many points of view, the use of metallic salts leaves a lot to be desired and some better method of treating cloth is urgently needed.

British Patent 446,379 describes the use of urea phosphate as a fireproofing material, which is simply applied yet resistant to water; at the same time it is non-hygroscopic and suitable for applying to fibers used for electrical insulating. The proofing liquor is prepared by mixing 2.4 kg. of 84 per cent phosphoric acid and 3.7 kg. urea. To the mixture, which is neutral and free from any tendency to attack textile fibers, 3 kg. of a phenol-formaldehyde condensation product in its intermediate stage of formation is added, and the whole made into solution with 24 kg. of methylated spirit. The textile goods are immersed in this solution, dried at 110° to 120° C. in order to remove the solvent and insolubilize the resin. The resulting fireproofed material resists flame on account of the fact that the filling decomposes to give ammonia, carbon dioxide and also phosphoric acid in a fusible form which tends to prevent the access of air to the affected region.

During the last few months an interesting new "inorganic resin" has been introduced which offers many advantages as a flameproofing agent for textiles. "Abopon" is a water-soluble liquid "resin" and has been described as an inorganic boro-phosphate. Although a mineral preparation it possesses resinous properties and does not crystallize on the material, nor cause whitening and powdering. It is claimed to cause no stiffening of the material, and brings about no destruction of the fiber or fading of the colors in dyed goods. Fabrics impregnated with this substance may be dry-cleaned repeatedly and will even withstand washing without undue loss of filling. For general use, the most satisfactory solution contains 17 lb. of the resin dissolved in 15 gallons of water, to which 2 oz. of wetting agent may be added. An increase in weight of approximately 1 oz. per yard in the case of cotton-rayon damask, may be expected.

*Chemical Age.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

NOVEMBER 15, 1937

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MEETING, PHILADELPHIA TEXTILE SCHOOL STUDENT SECTION

A REGULAR meeting of the Philadelphia Textile School Student Section was held on Friday, October 8th, at 3 P. M. with Chairman Wayne Fry presiding.

Taking the place of outside speakers, two members addressed the group. Mr. Fritz Kobayashi, 2nd year C & D man, spoke on "Physical Testing," and Mr. Pappy Long of the 3rd year C & D class spoke on "Methods Used in Dry Cleaning." The talks proved interesting and were received with such enthusiasm that two more members, Mr. Walker and Mr. Eddington, will speak at the next meeting.

Respectfully submitted,

ROBERT F. ROECKER, *Secretary.*

MEETING, MID-WEST SECTION

A MEETING of the Mid-West Section was held on Oct. 16, 1937, at the Hotel Bismarck, Chicago, Ill.

The usual interesting forum discussion was held in the afternoon under the direction of Mr. Charles Lennox, who received the thanks of the members present for his fine efforts.

Dinner was served at 7:30 P. M. with 89 members and guests present and the meeting was called to order by Chairman Siegrist.

The minutes of the May 8th meeting and outing of June 19th were read and approved.

The members present were reminded again of the national meeting at Philadelphia on Dec. 3rd and 4th. Mr. Norman Ruston made an appeal from the floor asking the members to be certain to vote and give the candidates the consideration they are entitled to in a national convention.

It was also voted upon to have our annual meeting and election in Chicago early in February.

The speaker of the evening was Dr. P. G. Bird of the National Aluminate Corporation, whose topic was "Modern Trends in Water Treatment for Textile Purposes." His talk and diagrams were so well received that he was kept busy for an hour after his talk answering questions and problems.

The meeting was adjourned at 10:30 P. M.

Respectfully submitted,

HERBERT W. TETZLAFF, *Secretary.*

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Abstracts

of papers to be presented at Annual Meeting

(*Additional abstracts will be found on page P706*)

Abstract

RECENT TRENDS IN TEXTILE TECHNOLOGY

EDWARD R. SCHWARZ, F.T.I.
Professor of Textile Engineering, Mass. Institute of Technology.

EVER since the first man pulled on a strand of twisted lianas to test its strength, the tensile strength of textile materials has been considered the most important and useful property of fiber, yarn or fabric. Except for particular uses it has little to recommend it as a measure of the quality of the material. Of greater interest in many cases is the fatigue strength or resistance of the textile to repeated stresses of less than the breaking strength. This value corresponds more nearly to the conditions met in service.

Thus the tire cord manufacturers are becoming much more interested in the strength changes due to repeated flexing, and the stretch produced by loads much less than the ultimate strength. And in the growing realization of the inadequacy of simple strength tests other measurements are being investigated. Among them are to be found the determination of torsional and flexural rigidity; twist conditions as they actually exist in the yarn at the time of use; resilience; tearing strength; bursting strength; plastic and elastic properties; the mechanism of moisture absorption; fastness to washing, light, crocking, perspiration, abrasion, and weathering; air and water permeability; crimp and micro analysis of fiber yarn and fabric structure. Use of ultra violet light; the spectroscope; the motion picture camera; the stroboscope; the high speed motion picture camera; the spectrophotometric color analyzer; and the technique of X-ray diffraction analysis of the ultimate structure of fibers is sign of progress.

Further there is the rapidly increasing use of the statistical method in the analysis and interpretation of the data resulting from any or all of the many textile tests now being made. The problem of proper and adequate sampling; the problem of the precision of the observations and the averages of the observations; the problem of proper and intelligent plotting of data; are all receiving considerable attention. In addition, because of the increasing precision and intelligence with which textile testing is now being carried on, the variable factors which influence the tests are being studied so that they may be eliminated, minimized or corrected for.

The trend of textile technology is toward a better understanding of the fundamental properties of textile materials. It is toward better technique which will take advantage of the newer discoveries in science. It is toward use of precision methods and statistical analysis of results. It is toward intelligent interpretation of the results of research for the benefit of the textile industry, and of the ultimate consumer.

Abstract

EXTRANEOUS MATTER IN TEXTILE MATERIALS

BERTIL A. RYBERG
Research Associate at Lowell Textile Institute

AN investigation of the nature of the material obtained by the extraction of wool with ethyl alcohol.

Abstract

SUGGESTIVE OBSERVATIONS ON THE WETTING, MERCERIZATION AND DYEING OF CELLULOSE

CHARLES F. GOLDTHWAIT and EARL MCLEAN
Industrial Fellows of Mellon Institute

THIS paper presents incidental observations made during extensive studies on processing cotton yarns. While the observations may be of some interest in themselves they are believed to have more value in suggesting additional research which may help explain important cellulose phenomena.

Abstract

METALLIZED AZO DYES

DR. M. L. CROSSLEY
Research Director, The Calco Chemical Company, Inc.

THE introduction of certain metals in the molecular structure of azo dyes has a profound effect upon the capacity of the substances to transmit colored light and also materially influences the stability of the molecular system. Certain groups, such as the hydroxyl group, substituted ortho to the azo groups, are essential to proper metallization. These metallized azo dyes are not metallic salts since they are soluble while the latter are insoluble. Also, the metal is firmly bound in the molecule and is not readily affected by treatment with acid or alkali. The color and general characteristics of these metallized azo dyes vary with the nature of the metal and the structure of the dye.

In general it is found that chromium tends to produce bathochromic changes in the colored light transmitted, while copper gives hypsochromic effects. Nickel and cobalt are similar in behavior to copper. Iron gives mixed effects, resulting in the production of browns. Interesting changes are brought about in the dyeing properties of these azo dyes by introducing metal in this manner and their usefulness is greatly enhanced.

The influence of position isomerism is of about the same order as in the unmetallized products.

The exact nature of the relation of the metal to the other components of the dye molecule is still indefinite. However, it would appear safe to say that the dynamic molecular conditions localized in certain groups in the molecule and associated with the phenomenon of radiant energy absorption has been markedly changed. If we look upon these color bearing groups in the molecule as systems which are capable of responding to increments of radiant energy of definite characteristics similar to the way that tuning forks respond to definite sound vibration, then we may expect that the metal has served as a modifier of the "color tuning forks". The absorbed radiant energy must influence the energy level in the molecular system and thus influence the reactivity of the system. It is not simply a question of amount of energy in the system but also a far more important question is the distribution of that energy and the changes which this undergoes.

Some of these metallized azo molecules appear to possess much greater light fastness than the corresponding unmetallized products, and this often makes it possible to convert fugitive azo dyes into satisfactory commercial products. Typical examples of these products are the Calcofast dyes which are now producing such excellent results in high quality leather dyeing.

Under certain conditions certain of the metallized dyes are converted into spirit soluble dyes which are much faster to light than ordinary spirit soluble azo products.

Abstract

A NEW ORGANIC SYNTHESIS

A. FRANK BOWLES
E. F. Houghton & Co.

1. How the system came into being, graphs showing details of the postulation.
   (a) Theoretical possibilities.
   (b) Actual demonstratable yields.
2. The use of the synthesis for obtaining chemically pure alcohols and hydroxy compounds, not obtainable by ordinary means, at fractions of present costs.
3. The preparation of ethers, esters, etc., by the synthesis.
   (a) Aliphatic and aromatic ethers.
   (b) Aliphatic and aromatic esters.
   (c) Mono, di and tri glycerides and mixed glycerides.
4. The preparation of primary and secondary amines and amides.
5. Rearrangements of the compounds under 3 and 4 to give various stable compounds for use in textiles, etc.

The synthesis is based upon the hypothesis which may be generalized as "a law of organic reactivity as follows:

"The ortho boric acid esters of an aliphatic or aromatic hydroxy compound will condense under suitable and controllable conditions with aliphatic or aromatic hydroxy or carboxy compounds to form ethers and esters, etc., etc....."

The purification and condensation synthesis utilizes the reversible reaction of weak inorganic acids from the group Boron, Silicon, Titanium and Selenium, thus:

(a) $H_3BO_3 + 3R\text{-}OH \rightarrow R_3O_3B + 3H_2O$
(b) $R_3O_3B + 3H_2O \rightarrow 3R\text{-}OH + H_3BO_3$

Since boric acid is known to exist in a wide range of anhydride forms, chief among which is $(B_2O_3)x$ such boron anhydrides have been found ideally suitable for catalyzing an indefinite number of aliphatic and aromatic rearrangement compounds.

The boric acid (or similar weak inorganic acid) esters of the aliphatic or aromatic alcohol are first prepared and then reacted with molecular equivalents of an alcohol or acid to give an ether or ester which may be caused to rearrange by means of the boron (or similar weak inorganic acid) anhydride produced in the reaction mixture.

Note: The reactions to be presented will deal only with compounds of interest in processing and finishing work for textiles, etc.

ANNUAL MEETING AND CONVENTION

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Chairman, Reception Committee

ARTHUR E. JONES, JR.
Chairman, Entertainment Committee

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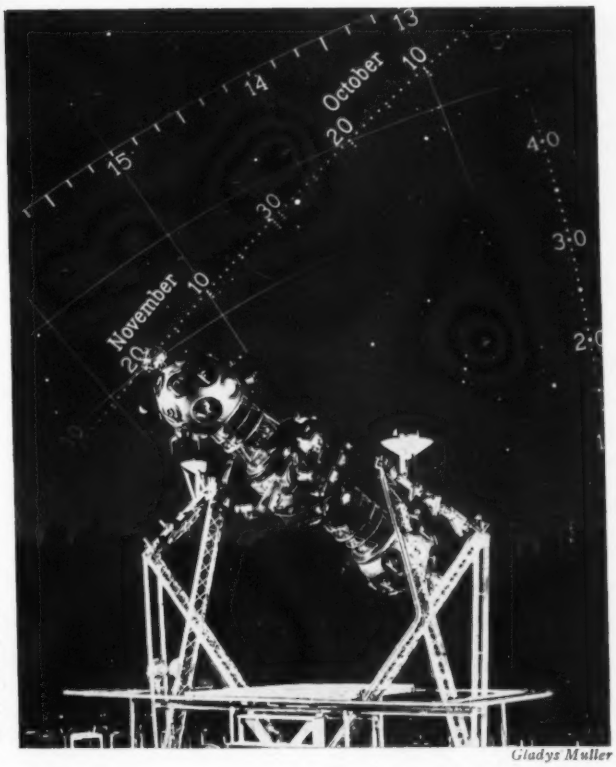
DECEMBER 3rd and 4th, Philadelphia, Pa.

"The Convention City"
Annual Meeting and Convention
Philadelphia, Pa., December 3 and 4

SIGHTSEEING

The Photo-Illustrators

Above—**FRANKLIN INSTITUTE**—This museum contains more than 4,000 exhibits, most of them operating at the touch of a button, demonstrating dramatically the part that science plays in everyday life and industry. Sections are devoted to astronomy, aviation, chemistry, electrical communications, graphic arts, physics, transportation and other fields of applied science.



Gladys Muller

Right—**FELS PLANETARIUM**—Through the Planetarium instrument it is possible to recreate the pageant of the heavens, as seen at any time in the past, present or future, and as seen from any place on this earth. The demonstration arranged for our visit will feature "Christmas Skies" which is a dramatic presentation of the Christmas story with appropriate music.

ENTERTAINMENT

THE Entertainment Committee announces that all plans have been made for a gala Vaudeville Show —Fine Music—Luncheon—Bridge—Sightseeing Trip—etc. Special entertainment has been arranged for Ladies, who may accompany our members.

Tentative Technical Program

for Annual Meeting

Philadelphia, Pa., December 3 and 4, 1937

A. Frank Bowles of E. F. Houghton & Co.—"A New System of Organic Synthesis and Its Application to Textile Assistants."

Dr. M. L. Crossley of the Calco Chemical Co.—"Metallized Azo Dyes."

Bertil A. Ryberg, Research Associate at Lowell Textile Institute—"Extraneous Matter in Textile Materials."

E. W. Pierce of the Ciba Company—"Practical Consideration of Modern Wool Dyeing Methods."

Dr. Isaac Godlove of E. I. du Pont de Nemours & Co.—"Color Measurement in the Dyestuffs Industry with Special Reference to Fastness Tests."

Dr. Milton Harris, Research Associate at National Bureau of Standards—"What Can the Mill Man Expect from Fundamental Research?"

Dr. Herbert F. Schiefer of National Bureau of Standards—"Evaluation of Crease Resistant Finishes for Fabrics."

Wm. D. Appel of National Bureau of Standards—"The Use of Standard Dyeings for Color Fastness to Light."

J. B. Crowe of Procter & Gamble Co.—"Detergents and Their Application to Textile Processes."

Dr. Irving J. Saxl, Consulting Physicist—"The Quantitative Measurement of Stiffness and Resiliency."

Dr. Edward R. Schwarz of Massachusetts Institute of Technology—"Trends in Textile Technology."

Charles F. Goldthwait and Earl McLean, Industrial Fellows of Mellon Institute—"Suggestive Observations on the Wetting, Mercerization and Dyeing of Cellulose."

—♦ ♦—

Abstracts

of papers to be presented at Annual Meeting

Abstract

PRACTICAL CONSIDERATION OF MODERN WOOL DYEING METHODS

EDW. W. PIERCE

Ciba Co., Inc.

THE entire subject of wool dyeing is discussed from the practical point of view, rather than from the scientific, or rather the best of the modern scientific developments are presented in a form that may be utilized by the practical dyer, for the betterment of his output.

First there is a discussion of the water supply and the operations connected with the delivery of the material to be dyed, in as clean and pure a state as possible. Then the methods employed for the dyeing of loose wool, slubbing, yarns, piece goods and finally vigoreux printing. At each stage machines, dyestuffs and assistants are reviewed, with a comment on their utility, in so far as increased production and maximum fastness of results are concerned. There is a short comment on the newer adjunct of the wool and worsted business, viz. cut staple rayon and the ways of adapting its use in connection with wool. The author has refrained from advocating any particular dyestuff or group of dyes, except in very general terms, for any specific purpose, aiming rather to establish safe rules of procedure for each separate class of materials.

Abstract

COLOR MEASUREMENT IN THE DYESTUFFS INDUSTRY WITH SPECIAL REFERENCE TO FASTNESS TESTS

DR. I. H. GODLOVE

E. I. du Pont de Nemours & Co., Inc.

IN this talk a number of practical problems arising in the manufacture, testing and use of dyes will be classified as being best studied and solved by the aid either of certain physical instruments (spectrophotometers, colorimeters, etc.), or of simple visual methods. Recommendations of the type of instrument or of visual aids will be made for each problem in turn. The translation of the instrument measurements to color "as it is to the eye" will be illustrated by showing the steps, with actual measurements and colors. It will be shown why instruments can only rarely be expected to "see" as the eye does. When they do not "see alike," some people assume that the instrument is right and the eye wrong, others that the eye is right and instrument wrong. It will be shown that both are right, but "see" correctly different things; and which to rely upón depends on the type of problem. Emphasis will be placed upon the consumer's point of view as being largely visual, and the dye maker's as being largely analytical or objective (therefore stressing instruments),

whereas the testing and service laboratory must employ both methods. Further, it will be urged that the dual point of view and dual method of measuring color is profitable always. The principle of the spectrophotometer will be shown by an arrangement of pocket size. A simple practical solution of important visual problems will be illustrated. For example, a simple means will be shown for making the present qualitative fastness scales more definite and quantitative; how the colors of the thousands of new dyes made each year can be catalogued and filed for quick reference years later; how customers in California may be telegraphed the colors of dyes in simple code; and, on the other hand, how new instruments, not generally in use, can remarkably simplify certain dyestuff problems.

Abstract

WHAT CAN THE MILL MAN EXPECT FROM FUNDAMENTAL RESEARCH?

Dr. Milton Harris

Research Associate at National Bureau of Standards

A STATEMENT which the investigator in the field of the more fundamental aspects of textile chemistry frequently encounters is, "this is all very interesting but where does it fit into my picture?" This statement arises from the tendency to consider only the practical applications of chemistry, rather than the theoretical principles and fundamental discoveries. The achievements in fundamental textile research are generally not so apparent as are the developments in the industrial laboratory since they can not be directly translated in terms of lower costs and extended uses. But they are extremely important to the future of the textile industry just, as for example, the results of the researches of Irving Langmuir on surface chemistry, which were started with no practical end in view, have produced new industries, new products, and new conveniences.

When rayon was first put on the market, a committee appointed by silk manufacturers to study its possibilities declared it a passing fad. The reason for this unfortunate conclusion was probably attributable in part to a lack of understanding of the possibilities of scientific research. However, even today, similar decisions are constantly being made. The difficulty, it appears, lies in the fact that we have an ample supply of administrators and scientific investigators but that we unquestionably lack capable interpreters, men who can understand the fundamental knowledge and translate it into the language of the mill man.

The results of a research program on the chemistry of wool, which is being done at the National Bureau of Standards for the American Association of Textile Chemists and Colorists have indicated many parallelisms between the fundamental chemistry of this textile material and that of many biological substances which are so important in studies relating to cancer, arthritis, and diabetes research. The data obtained by the workers in what appears to be such widely different fields as textiles and medicine are now being exchanged to mutual advantage. The boundaries of science are rapidly losing their significance and it is imperative for the investigator of fundamental textile chemistry to acquaint himself with many new fields of research. In addition, he must learn to seek the fundamental nature of the problems in his field but above all, he must learn to interpret and impart this acquired knowledge, since only by understanding it, can the mill man hope to utilize it.

Abstract

EVALUATION OF CREASE-RESISTANT FINISHES FOR FABRICS

Dr. Herbert F. Schiefer

National Bureau of Standards

WITH the advent of anti-crease finishes in the commercial production of cloths it has become increasingly important to measure the improvement of the cloths resulting from the finishing treatment and also the resilience of fabrics in general. The A.T.T.C.C. recognized the need for adequate test methods for evaluating anti-crease and permanent finishes and appointed a committee early in 1936 to develop standard test methods. The effect of crush-resistant finishes on transparent velvets was studied, using the compressometer method, and the results were published in the November issue of the *Journal of Research* of the National Bureau of Standards, Research Paper RP1047, and in the November Quarterly Research Number of the American Dyestuff Reporter. The present discussion is concerned with the effect of anti-crease finishes on plain woven fabrics.

Certain flexural characteristics of representative woven fabrics before and after the application of commercial crease-resistant finishes were measured using three independent methods, namely the creasing angle, flexometer, and modified compressometer methods. Specimens of paper, cellophane, cotton, rayon, worsted, and rubber, having crease resistances ranging from low to high values, were also measured and used as a basis of comparison.

The crease-resistant finishing treatments increased the energy required to deform the cloth specimens, that is, it increased the stiffness of the cloths. This increase exceeded 100 per cent for some of the cloths. The energy of recovery was also increased by these treatments, the increase ranging from 20 to 100 per cent. Neither of these two quantities can be taken individually as a measure of crease resistance. However, the ratio of the latter to the former, here termed "resilience," bears a definite relation to the resistance to creasing. The resilience of nearly all of the cloths, as determined by each of the three test methods, was increased by the crease-resistant finishing treatments.

The three test methods described can be used to evaluate the improvement of crease-resistant finishes, using the

measurements on the cloths before treatment as the basis of comparison. Resilience may be a suitable criterion of crease resistance of fabrics in general. Much more work will have to be done, however, before limits of resilience can be established as standards for crease resistance.

Abstract

THE USE OF STANDARD DYEINGS IN TESTS FOR COLOR FASTNESS TO LIGHT

W. D. Appel

Chief, Textile Section, National Bureau of Standards
Chairman Sub-Committee on Light Fastness, A.A.T.C.C.

COMMITTEES have been actively at work for years in Germany, in England, and in the American Association of Textile Chemists and Colorists in the United States on the development of methods for testing color fastness to light of textiles. Their independent studies have led to the same general conclusions and as a result of them each committee is issuing standard dyeings to be used as a basis for practical testing. International agreement has been reached on four of the eight standards and may be expected on the others soon. This talk is concerned with why such standards are necessary and how they should be used.

The ideal test for color fastness to light would require apparatus with which the fading resulting from exposure in service could be duplicated in a short exposure, say twenty-four hours, and instrumental means for measuring the fading. The first is approximated in available apparatus, but the amount of fading produced by exposure for a given number of hours both in the same and in different fading lamps varies greatly from time to time. The cost of the equipment to eliminate this variation is prohibitive. Fortunately, the relative fading of dyeings in these lamps is reproducible. By testing simultaneously the fastness of the materials in question and of standard dyeings of known fastness issued to all laboratories by a central source, it is possible for all to arrive at the same ratings of fastness.

Quantitative methods for evaluating the changes in color of dyeings when they fade are not available in most textile laboratories and too slow for routine testing though they may be used to advantage when visual judgment is uncertain. The changes in color of the standard dyeings furnish a guide when the method of visual inspection is used. Most fading can be judged rapidly and satisfactorily in this way.

Now the standards have been selected and the way in which they can be used to the best advantage will be discussed.

Abstract

THE QUANTITATIVE MEASUREMENT OF STIFFNESS AND RESILIENCY

Dr. Irving Saxl

Consulting Physicist

AMONG the various factors that are summarized under the description of handle and feel, the resistance to bending and the elastic recovery after such deformation play an important role.

Means have been developed by various experimentors to evaluate stiffness quantitatively. A short history will be given regarding the principles of testing involved in measuring stiffness, and a new apparatus described which has a particularly large range of operation, permitting the measurement of stiffness on soft materials such as muslins, up to very stiff materials such as heavy over-coatings.

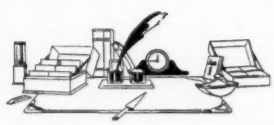
In addition, this instrument is independent from the influence of differences in the specific gravity of the sample to be tested.

The technique of stiffness measurements will be discussed in detail as it relates to load-versus deflection characteristics, mechanical hysteresis, elastic recovery, and permanent deformation.

The influence of fabric constructions and different methods of finishing will be discussed, and also the use of the stiffness tester for the purpose of evaluating the effectiveness of softening agents, stiffening agents, and elastic finishes.

A model of the Stiffness Tester will be demonstrated, and lantern slides of graphs shown, interpreting the means by which the quantitative determination of the percentage of recovery and the complete mechanical analysis of the fabric, as well as it flexural characteristics are concerned, can be made.

(Additional abstracts will be found on page P703)



AMERICAN
DYESTUFF
REPORTER

Vol. 26 November 15, 1937 No. 23

FRANCIS P. GARVAN

THE chemical industry of the United States lost one of its foremost champions when Francis P. Garvan, president of the Chemical Foundation, Inc., died on November 7th at his home, 740 Park Avenue, New York City, after being stricken with pneumonia a few days previously. His age was 62.

Mr. Garvan perhaps became best known to the chemical industry for his work during and since the World War. Following the entry of the United States into the war he became chief of the United States Bureau of Investigation in New York and later became Alien Property Custodian and took up his duties in Washington. In this office he seized control of the German dye patents and properties for the government. In 1919, with the authority of President Wilson, he organized the Chemical Foundation which purchased from the government for $271,850 the 4,813 patents, 281 applications for patents, 876 trademarks, and 492 copyrights and rights related to chemical patents, all of which had been previously seized. Most were German dye patents and their subsequent lease to individuals and corporations on a royalty basis was the foundation for the entire post-war development of the industry in this country. The foundation had a capital of $500,000, in preferred and common stock, with interest limited to 6 per cent on each. Proceeds from royalties were devoted to research, to donations for the proper tabulation and publication of scientific data, to the establishment of scholarships and to other efforts to spread scientific education.

In 1922 Attorney General Harry Daugherty started proceedings to seize the patents which had been sold to the Chemical Foundation. During long litigation, Mr. Garvan fought the government successfully through the United States District Court in Delaware, the Circuit Court of Appeals and finally to the United States Supreme Court where the purchase of the patents by the Chemical Foundation was upheld.

In his position as head of the Chemical Foundation from the time of its inception until his death, Mr. Garvan has been looked upon as a leader in guiding the chemical industry to its present position of fourth largest in the United States. In 1917 this country had but six chemical plants.

Mr. Garvan was born at East Hartford, Conn., on June 13, 1875. He attended public schools and Yale University

FRANCIS P. GARVAN

from which he was graduated in 1897. He then attended the New York University Law School and graduated in 1899 beginning his law practice the same year. After the turn of the century he was for a number of years connected with the District Attorney's office of New York County, serving as assistant to William Travers Jerome. He later returned to private practice as a member of the firm of Garvan & Armstrong and then of the firm of Osborne, Lambe & Gordon, which business he continued until the entry of this country into the World War.

Mr. Garvan has always been especially interested in many philanthropic activities, having made many personal contributions. In 1923 he and Mrs. Garvan established a fund in memory of their daughter, Patricia Garvan, to sponsor national essay contests and establish six four-year chemistry scholarships at Yale and Vassar.

He was the only layman ever to receive the Priestley Medal, the highest gift award of the American Chemical Society. He was also the only layman ever to receive the Mendel Medal, awarded annually by Villanova College to that Catholic who has signally advanced the cause of science. He had received honorary degrees from Yale, Trinity and Notre Dame and the American Institute of Chemists had presented him a medal. In recent years he had been particularly interested in the National Farm Chemurgic Council, formed to promote the utilization of farm products for industrial purposes, and in the U. S. Institute for Textile Research.

He was possessed of tremendous vitality which he demonstrated on frequent occasions. His forceful personality became an integral part of the growth of the American chemical industry and he made a deep impression upon all with whom he came in contact.

He is survived by his widow and six children; also a brother and three sisters.

Spectrophotometric Identification

of an Ancient Dyestuff

A REMARKABLY permanent blue coloring matter which colored the tombs of the Pharaohs a thousand years before King Solomon built his temple was analyzed recently by industrial chemists. They found that in some ways this blue was similar to the present day pigment, ultramarine.

Analysis showed, however, that while this ancient blue was fast to light, heat, and most deteriorants like alkalies, mild acids, and salt water, it was inferior in many ways to existing blues. Its manufacture today would not be commercially practical.

Tests carried on at the Research Laboratories of The International Printing Ink Corporation recall interesting facts about the earliest known methods of dry color manufacture. This "Egyptian Blue" is the oldest artificial pigment. While certain colors and pigments made from herbs, animal matter, and insects (like the cochineal red of the Aztecs) may antedate Egyptian Blue, it is the first color to be actually compounded from inorganic substances.

Its use dates back nearly to the dawn of civilization. It was prepared and sold as early as 3000 B.C.—long before the empires of Greece and Rome even existed.

An analysis indicates that this same blue pigment which was popular in the days of Rameses and Tutankhamen was used centuries later in fresco work on walls of Roman cities. Fragments of a wall from the ruins of Pompeii (near the port of Naples in modern Italy) were analyzed and found to be colored by this old Egyptian Blue.

This is how these tests happened to be made. Chemists at IPI heard that samples of these early blues had been sent to a large museum in Massachusetts. Since the pigments were reported to have exceptional qualities of permanence—samples 3000 years old were still brightly colored—the laboratory men asked to borrow some of these ancient fragments for analysis. Museum officials sent down small amounts of known Egyptian Blue along with some wall pieces of Roman origin which they believed were colored with the same pigment.

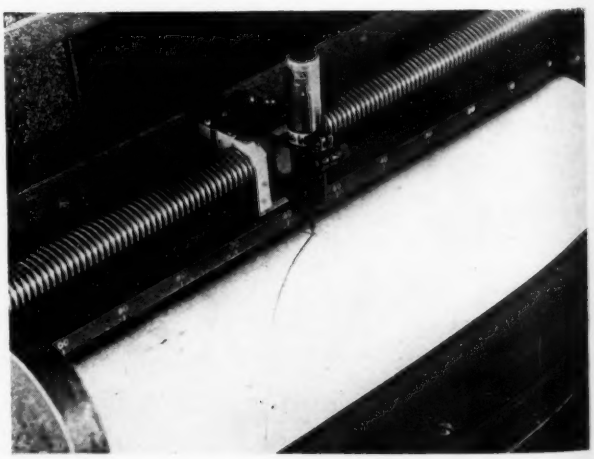
Any sort of chemical analysis would destroy the priceless samples, so it was decided to make a spectrophotometric comparison. This was accomplished by means of the recording photoelectric spectrophotometer—an instrument which automatically determines the light reflectance properties of any object by means of a complex photoelectric system. Applicable to all types of color analysis work, this machine may also be used in determining chemical compositions.

An analysis showed that the properties of the Egyptian Blue and the blue finish used to decorate the Roman wall were very nearly identical. The Egyptians who made this blue originally must have exported it to Rome, and probably to Greece, Persia, Phoenecia, Babylon and other countries powerful before the Christian era.

Here is a photograph of the recording photoelectric spectrophotometer in operation. The color sample to be analyzed is placed at the end of the long tube. Its characteristics, transmitted by a photoelectric system, are translated into a prosaic locking curve traced on a recording drum in the foreground.

Research men discovered that until very recently the secret of this pigment's manufacture was unknown. An English scientist who has studied this subject learned that since the second century A.D., the formula and procedure for making the blue had been lost. He announced last year, however, that he had reconstructed one of the early

This stylus point traces a curve on the moving graph drum to outline the reflectance properties of any one of about two million colors that the spectrophotometer can distinguish. It takes about three minutes to trace one of these color curves.



Egyptian furnaces and had determined just how this oldest artificial pigment had been made.

He found that sand had been mixed with lime, soda, and copper carbonate—one of the earliest metal ores. Then this mixture was heated to a temperature between 1450 and 1650 degrees Fahrenheit, and this heat was maintained for several days. Exact temperature control was an essential factor in the process, and how early peoples with no thermometers or temperature control devices managed to keep the heat at proper intensity is a credit to their ingenuity. In all probability, temperature was noted and regulated by judging the heat of the glowing mass by its color.

Apparently, to a race that built the Pyramids and constructed temples which still stand today, a problem in temperature control was by no means insurmountable.

Dyeing

Acetate Rayon Piece Goods*

J. M. HILL

THE first and most important rule to be observed in any dyeing operation is to begin with a clean fabric. The dyer's job is not the dyeing of sizing materials but of fibers or fabrics which have been freed from such materials by suitable preliminary processes. In acetate rayon dyeing the operation of bleaching does not come into consideration but a desizing treatment is absolutely necessary. If the goods are received for dyeing from one particular source, the manner of sizing is usually known and may even in such cases be suitably modified to suit the dyeing processes. On the other hand it is often the case that the goods are received from a number of different sources and as a consequence the manner of sizing is varied in proportion. It would hardly be possible to detail all the different sizes and combinations thereof which might possibly be used in the manufacture of acetate rayon fabrics but the following types are commonly used. Vegetable sizes, e.g., gum tragacanth; locust bean thickeners and similar vegetable gums. Fatty and waxy bodies, e.g., linseed oil; castor oil; greases, fats, and waxes of various descriptions; starches and flours; glue and gelatine. All of these bodies present individual problems in the manner of their removal and the dyer must know how to deal with each one as it arises.

The manner of the removal of the sizes depends to a large extent upon the fabric to be dealt with, and sizes which may be quite easily removed on one type of fabric may present peculiar difficulties on another. For instance in the present case of acetate rayon, the removal of linseed oil or any fatty matter is complicated by the fact that the use of alkali is out of the question if dyestuffs for acetate rayon are to be used. In viscose rayons such sizes would be easily removed by treatments in soap and soda ash solutions but with cellulose acetate other methods have to be adopted. The reason for this is of course, the danger of saponification of the acetate rayon which would in such a case resist the application of the acetate dyestuffs to the extent of such modification.

It is of the first importance to identify the size in each case before proceeding to desize and the following simple tests will usually suffice. Starch sizes give the usual blue color with iodine the intensity of the color varying in proportion to the amount of starch. Gum tragacanth and similar vegetable bodies give a white voluminous precipitate with lead acetate solution, re-dissolving on the addition of acetic acid. Gelatine, glue, etc., give a characteristic violet color with Fehling's solution. Fats, waxes, linseed oil, etc., may be distinguished by the use of some of the fat-soluble dyestuffs when the fats, etc., will become colored on immersion in the appropriate solution. When the type of size has been detected the next step is the devising of a suitable means for its removal.

The sizes most easy to deal with in this respect are vegetable gums, e.g., tragacanth, locust bean, etc., gums of all kinds, glue and gelatine. Tragacanth and locust bean sizes may be removed by a thorough wash in cold water while hot water will remove all the others provided the washing treatment is sufficiently thorough. In many cases a soaping treatment or the use of some of the sulfonated fatty alcohols may also prove beneficial. Starch sizes do not present any great difficulty in that the use of a diastatic medium will produce the desired effect if used in the usual manner, i.e., a steeping treatment followed by a hot water rinse. Fats of all kinds and linseed oil in various stages of oxidation present the greatest problem to the dyer but even in these cases modern assistants make the task easier. Products with a sulfonated oil basis plus a proportion of an organic solvent, e.g., methylcyclohexanol may be used successfully for this type of work. With linseed oil especially, some product which combines high emulsifying power with good solvent properties is indicated.

When handling fabrics with a crepe construction the goods should always be desized prior to crepeing. It is sometimes advised that desizing and crepeing may be carried out in one bath but the practice is to be depreciated except in the case of very small lots. If attempts are made to desize and crepe in one operation the result will be that the crepeing bath will speedily become overcharged

*Silk Journal and Rayon World.

with size residues and so interfere with the desizing, crepeing and dyeing of subsequent lots of goods. It is reasonable to suppose that goods may neither be desized nor creped satisfactorily in a bath which contains an excessive amount of such residues.

Where crepeing and dulling are carried out in one operation in strong soap solutions it is also important that the goods should be freed from excessive soap deposits before dyeing. To ensure this the pieces are well washed after crepeing in solutions of sulfonated fatty alcohols, Calgon or similar compounds. The very nature of crepe fabrics makes for easy retention of soap deposits, etc., and for this reason the final washing should be all the more thorough before proceeding to dye.

NATURE OF THE DYEING PROCESS

In the case of cellulose acetate the nature of the dyeing process is rather different from the usual conceptions of dyeing processes. Opinion seems to be divided between the "solid solution" theory, and chemical reaction in some measure or other between the fiber and the dyestuff. One point about which there is no doubt is that the cellulose acetate has a definite affinity for certain suitable dyestuffs in a highly dispersed state. So much is this so that dry cellulose acetate placed in contact with dry acetate dyestuff powder will in due course absorb some of the latter in the local areas in contact with the dyestuff. On examination it will be found that the colored fibers have been "dyed" in exactly the same way and to the same extent (locally) as fibers dyed by ordinary methods. It has also been found that a stage of equilibrium is reached between the amount of dyestuff in the dyebath and on the fiber and that the ratio thereof has a value dependent upon time, temperature and composition of the dyebath. It is one of the essential features of the dyeing of acetate rayon that the dyestuff must be in a very highly dispersed condition otherwise the reaction between the dyestuff and the fiber which has just been outlined cannot take place. The dispersion of the dyestuff throughout the body of the rayon fibers is such that cross sections of the fibers have been obtained which reveal the fact that a perfectly homogeneous relationship has been established between the dyestuff and the fiber.

Dyestuffs are marketed in two forms, namely powders and pastes. In both cases, however, the dispersion is such that there is usually no difficulty in preparing the dyebaths. In the case of the powder brands all that is required is the pasting of the powders with a small amount of water and subsequent dilution to a volume suitable for addition to the dyebath. In some cases it is recommended to carry out the dyeing process without any additions other than the dyestuff while in other cases the use of turkey-red oil, sulfonated fatty alcohols, soap flakes and similar bodies are advised in order to aid dispersion. The paste brands are merely diluted with water and sieved into the dyebath. This latter precaution should be taken with all dyestuff dispersions whether from powder or paste brands, in case of accidents.

When dyeing with mixtures it will often happen that the separate dyestuffs which compose the mixture may exhibit considerable differences in the mobility of their dispersion. This difference is often accelerated by high temperatures and the consequence is uneven dyeing or differences in shade when producing repeats, unless the conditions are very carefully controlled. It should also be remembered that cellulose acetate is only capable of holding a certain amount of dyestuff in the true dispersion phase which exhibits the pure tone and depth of the desired shade. If this point should be over-reached then a flattening of the shade will result as often happens when attempting to dye very deep shades beyond the capacity of the fiber to cope with the dyestuff. Stripping of the dye is as a rule the only remedy for such a state of affairs.

METHODS OF DYEING

In connection with the method to be adopted in producing the dyed shades on any particular class of fabric much will depend upon the nature and construction of the said fabric. One of the greatest difficulties which is encountered in the processing of cellulose acetate is the fact that it is very liable to the fault of creasing as the result of careless handling. The principal reason for this is the nature of the fibers. It is well known that the cellulose acetate fibers under certain conditions are very pliable and easily "set." The conditions which most readily favor the fault of creasing are therefore those in which the fibers are most liable to be creased at high temperatures and suddenly cooled before sufficient time for adjustment of the fibers to the new conditions has been allowed. In such cases as for instance the sudden immersion of fabrics from the hot dye liquors into cold rinsing baths. In the hot liquors the fibers are very pliable and the sudden immersion into cold liquors is akin to the sudden cooling of warm wax which under such conditions will retain the form it had taken on in the warm state. For this reason therefore, acetate rayons should never be cooled suddenly in this fashion but rinsing-off should take place in warm water. Cold rinsing is never necessary, neither is it desirable in consequence of this fact.

When treating lustrous materials, e.g., twills, taffetas, etc., tensionless dyeing on the jig may be carried out although the actual dyeing process is very slow. When dyeing deep shades in this way, periods of twenty-four hours dyeing before the shade is fully developed have not been unknown. The danger of the creasing of such materials is so great that nothing else but an open width treatment is safe. On the other hand there are types of fabrics which may only be processed safely in the rope form, namely crepe constructions. The danger here is of distortion or loss of the crepe effect under the influences of even a very small amount of tension in the open width. Dyeing in such cases is carried out in elliptical winch becks with peg-rails so that the fabric is circulating constantly in the dye liquor while yet the greater part of it is immersed. By this method the process of dyeing is con-

siderably hastened and very level shades are produced. It is hardly necessary to emphasize the fact that cold rinsing, etc., has also to be avoided in the case of crepe constructions.

In the case of lustrous fabrics it is important to control the temperature so that it does not exceed 185° F., otherwise loss of luster may occur. In the presence of soap the dyeing temperature should not exceed 170° F. When dyeing dulled crepes, however, neither of these precautions need be observed. In fact the presence of soap in the dyebath at high temperatures may in such cases prove beneficial in correcting any tendency to reluster.

For light and medium shades dyeing should commence hot about 120-140° F. and be slowly raised to 185° F. continuing at this temperature for 1-2 hours or more as required. In the case of deep shades, dyeing should commence at 185° F. and proceed thus until the dyeing is complete.

The slow rate of dyeing may also be accounted for by the fact that cellulose acetate is notoriously difficult to wet-out. While it is understood that the dyeing process is not one of absorption in the ordinary way yet the fact remains that the dyestuff dispersion is contained in an aqueous medium and permeation of the fabric is the means used to bring the dyestuff particles into contact with the individual fibers. It is also known that wetting-out depends largely upon the number of hydroxyl (OH) groups present in the fiber and cellulose acetate is very deficient in this respect. Cellulose acetate consists principally of di-acetate with a small amount of tri-acetate. The di-acetate contains one hydroxyl (OH) group, the tri-acetate none, while regenerated rayon contains three hydroxyl groups. This accounts for the difference in wetting-out properties and provides a reason for the use of a good wetting-out agent which in addition to acting as dyeing assistant will minimize the risk of creasing.

TRADE NOTES • NEW PRODUCTS

OBITUARY

THOMAS W. FRANCE

THOMAS W. FRANCE, who for 33 years represented H. W. Butterworth and Sons Company in the New England territory, operating out of Providence, R. I., died suddenly September 26 while returning to his home after visiting friends.

Mr. France, who was of English parentage, had been identified with the textile industry practically all his life. During the past few years he had suffered several heart attacks similar to the one which resulted fatally.

He is survived by his widow, Mrs. Flora France. He was buried September 29.

• PAN AMERICAN RELEASES

The Pan-American Color & Chemical Co., 48 Bleeker St., Paterson, N. J., announces release of color cards on the following products:

Panacet Rubine B Conc.—for acetate, said to leave rayon effects unstained. Its fastness to dry cleaning, perspiration, light and washing is said to be very good. It is further said to have a very rapid absorption rate.

Panacet Brill. Pink 2 B—for acetate. Its fastness to dry cleaning is said to be very good and to perspiration, light and washing, good. Its absorption rate is said to be very rapid.

Panacet Brill. Blue B (new)—for acetate, said to leave rayon effects unstained. Its fastness to dry cleaning, perspiration, light and washing is said to be very good. Its absorption rate is said to be very rapid.

Panacet Fast Violet R—for acetate, said to leave rayon effects unstained. Its fastness to dry cleaning, perspiration, light and washing is said to be very good. Its absorption rate is said to be very rapid.

• CIBA REVIEW

Copies of a new monthly publication entitled *Ciba Review* have recently been distributed. It is published by the Society of Chemical Industry in Basle, Switzerland, and copies are available upon request to the Ciba Company, Greenwich and Morton Streets, New York City. In the foreword it is stated that it will be devoted to a varied succession of articles on the history of dyeing, printing, tanning, weaving, etc., and the numerous supplementary crafts connected with the refinement of textile products. The foreword continues as follows:

"The publication of weighty and erudite treatises is not within the chosen scope of this periodical. The editors' aim is rather to quicken the interest of the reader in the history of dyeing and its cognate spheres, by means of articles which, though written by experts, should be of general appeal.

"Short notes on science, technics, and other subjects will be welcomed by readers not historically interested. Not the least of the aims of the Ciba Review will be to inform its readers as to Ciba products old and new, and to give useful practical hints for the various branches of dyeing."

Supplements with patterns of dyes will be contained at intervals.

Among the contents of this first issue are three articles by Alfred Leix: The Sociological Basis of Mediaeval Craftsmanship, Dyeing and Dyers' Guilds in Mediaeval Craftsmanship, and Dyes of the Middle Ages. Other articles are: Guilds In Mediaeval England and Scotland, by Walter Bird, Mediaeval Love of Color by A. Chevalier, Historical Gleanings and Technical and Scientific Notes. The publication is profusely illustrated.

• JOINS TECHNICAL STAFF

Warwick Chemical Company announces that Anthony F. Costello has joined their technical service staff at West Warwick, R. I. Mr. Costello has had many years of experience as a chemist in leading woolen and knitting mills, the last ten years having been connected with Lumb Knitting Co. of Pawtucket, R. I.

• APPOINTED DISTRICT MANAGER

H. J. Waldron, formerly associated with leading textile manufacturers in New England and Southern states, has been appointed New England District Sales Manager of the National Oil Products Co. of Harrison, N. J., according to an announcement by Charles P. Gulick, NOPCO president.

Mr. Waldron was formerly connected with E. F. Houghton & Company, Inc., for many years.

• PRODUCTION AND DISTRIBUTION

The study of production and distribution organization in the textile industries which the Industrial Research Department of the University of Pennsylvania is making under the sponsorship of the Textile Foundation and with the advice and assistance of representative trade groups, is nearing completion.

Field work on the study is already virtually completed and the preparation

of manuscript has been under way for some time. In the course of the field work about 500 interviews have been held with executives in the textile industries and in related industries and trades. Among those interviewed have been yarn producers, weavers, knitters, dyers, finishers, converters, cutters, wholesalers, and retailers.

The Industrial Research Department has been materially assisted in the study by a fine spirit of cooperation on the part of the executives interviewed. All have displayed interest in the study and have been ready to discuss the organization experience of their companies in detail, usually on the understanding that the identity of their company would not be revealed.

The first two chapters of the report are being designed as a "front window" to acquaint the reader with what the report is all about. They will show the character of the business organization problem in textiles and summarize the findings of the study in a fashion that is hoped will catch reader interest. In succeeding chapters more detailed treatment is given to specific problems of production and distribution organization at each of the principal market steps. While every effort is being made to provide a comprehensive appraisal of actual experiences, every effort is also being made to provide an interesting and readable report.

• RETURNS FROM CUBA

A. Brandt of the Technical Service Department of the Warwick Chemical Co., West Warwick, Rhode Island, has recently returned to the United States after spending six months in Cuba.

Mr. Brandt is well known in the textile industry in Cuba having spent considerable time there during the past seven years in the capacity of Technical Advisor with some of the prominent mills and dye plants.

After introducing and demonstrating the Warwick line Mr. Brandt returns with the assurance of the Cuban mill men that they at all times are anxious to learn more of the newer processes of dyeing and finishing and particularly so in conjunction with American manufactured textile chemicals and specialties.

• ELECTED VICE-PRESIDENT

At a recent meeting of the Directors of the Warwick Chemical Company, Dr. Dale S. Chamberlin was elected to the office of Vice President.

Donald S. Collard was appointed Chief Chemist.

• JOINS A. M. TENNEY

W. F. Macia, research fellow of the joint committee of the A.A.T.C.C. and the

W. F. Macia

Throwsters Research Institute on the Rayon Crepe Research Project, recently resigned that position and has joined the staff of the technical laboratory of A. M. Tenney Associates. In view of Mr. Macia's past experience his services should prove of value to the Tenney organization.

• CHEMICAL INDUSTRY MEDAL

The Chemical Industry Medal for 1937 was presented on November 5th to Mr. E. J. Crane, Editor of Chemical Abstracts, at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society, held at The Chemists' Club, New York City. Mr. James G. Vail presided. Dr. Austin M. Patterson first spoke on the accomplishments of the medalist and then the presentation of the medal was made by Dr. A. E. Marshall.

In accepting the medal Mr. Crane spoke on the importance of word usage in the transmission of scientific ideas, his paper being entitled "Words and Sentences in Science and Industry."

All branches of science have nomenclature faults and needs. Mr. Crane pointed out some of these of particular interest to the chemist.

Going from the general discussion of scientific language to a specific example, Mr. Crane pointed out that Chemical Abstracts, key to the world's chemical literature, is built up from words and sentences. He briefly discussed this journal and its objectives, especially pointing out the importance of correct words in the indexes.

Mr. Crane was born in Columbus, Ohio, February 14, 1889. He received his A.B. degree from the Ohio State University in 1911. He became associate editor of Chemical Abstracts in 1911 and since 1914 has been editor. Chemical Abstracts, published by the American Chemical Society, publishes brief reviews or abstracts of all scientific and technical papers of chemical interest appearing throughout the world and it also publishes abstracts of the patents of chemical interest issued in the various countries. Over 60,000 abstracts are now published each year of which about one-third are abstracts of chemical patents. In this work something over 2800 scientific, technical or trade periodicals appearing in 31 different languages are systematically examined. Under Mr. Crane's editorship the completeness of this abstract service has been developed and safeguarded and the abstracts have been supplemented by unusually thorough annual and ten-year indexes.

Mr. Crane's publications have been chiefly in the field of chemical literature. He is co-author with Austin M. Patterson of a widely used book in this field which is entitled "A Guide to the Literature of Chemistry."

As chairman of the American Chemical Society's Committee on Nomenclature, Spelling and Pronunciation during the past 23 years and as a member of the committee of the International Union of Chemistry for the Reform of Inorganic Chemical Nomenclature during a part of this period Mr. Crane has helped in the development in the fields represented by these committees. Besides a number of reports relating to nomenclature his report on "The Pronunciation of Chemical Words" has received wide attention in this day of radio broadcasting.

Mr. Crane is a member of the Executive Committee of the Division of Chemistry and Chemical Technology of the National Research Council. He is also a member of the American Chemical Society, American Association for the Advancement of Science, Sigma Xi, Phi Beta Kappa, Phi Lambda Upsilon, Lambda Sigma and Alpha Tau Omega.

• PERKIN MEDAL AWARD

Dr. Frank J. Tone has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1938. The medal is awarded annually for valuable work in applied chemistry and will be presented this year to Dr. Tone for his work in the development of abrasives and refractories. The selection is made by a committee representing the five chemical societies in the United States.

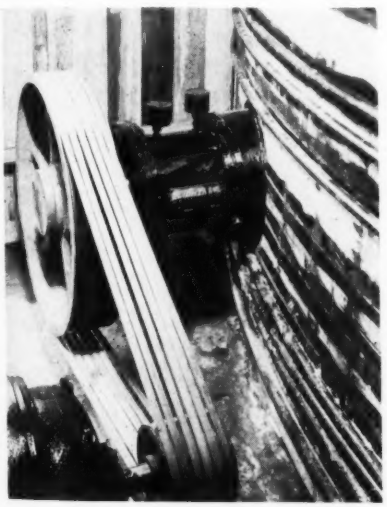
The medal will be presented on January 7 at a meeting to be held at The Chemists' Club. Details will be announced later.

• SIDE ENTERING MIXER

The Mixing Equipment Company of Rochester, N. Y., has just brought out a new Side Entering Propeller Type Mixer incorporating an entirely new and original type of stuffing box and bearing design which, it is claimed, eliminates the troubles previously arising from this source.

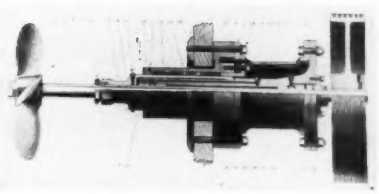
The Mixing Equipment Company, in building large Side Entering Propeller Type Mixers, faced for many years the common problem of stuffing box and bearing design. In their case, conditions were even more difficult and harder to solve because of the use of their mixers in applications where corrosion and chemical attack were serious problems. The accompanying illustration shows the unique and original method (patent applied for) by which these many stringent requirements were met. Of paramount interest in this new design is the fact that the stuffing box itself has no contact whatever with the shaft proper. A "folded back" member, (a hollow cylinder open at one end), securely attached to and revolving with the shaft, takes all wear at this point, positively prevents contamination of the mix from stuffing lubricants and prevents any damaging contact whatsoever between the tank contents and the bearings, it is claimed. Itemized, the most noteworthy features of this new unit are said to be as follows:

1. Bearings are placed well forward to prevent shaft whip.
2. Bearings are mechanically separated from the stuffing box.
3. No liquid from the tank can come in contact with the bearings.



New Lightnin "Bearing Guard" Angular off-center Mixer in a large Philadelphia Plant. The Stuffing Box is said to be Easily Replaced from the Outside.

4. Stuffing box is lubricated and can be reached from outside the tank.
5. All stuffing box wear occurs on the removable sleeve instead of on shaft. This "folded back" stuffing box design whereby the packing and bearings occupy the same linear dimensions, permits complete servicing of unit from outside of tank. The unit is being built in all machineable alloys in sizes up to Twenty



Cutaway view showing "Folded Back" Stuffing Box Construction of new Lightnin "Bearing Guard" Mixer.

H.P. For the present it will be furnished for Vee Belt Drive only.

While this new design fits this unit to all types of applications, it is not intended to supplant the more simple models now available, but is offered for difficult and hazardous locations where its additional cost is justified. Such applications include installations where the tank is never emptied, except in emergencies, where the product is explosive or otherwise hazardous to life, or where for any other reason it would not be feasible or safe to enter the tank for repacking. When mounted on a manhole cover, this unit is said to eliminate any necessity of entering the tank for installation, maintenance or repair.

Officials of the Mixing Equipment Company state that the company is considering the licensing of this principle for manufacture of non-competitive products such as pumps, turbines, boat shafts, etc.

• TOP DYEING MACHINE

This machine has recently been put on the market by Riggs and Lombard, Inc., of Lowell, Mass. It is stainless steel throughout and is said to offer the following advantages:

A great reduction in maintenance cost due to the elimination of all wood, of stuffing boxes in the pump, and of all exterior piping with its attendant leaks; also the fact that the motor is on top of the machine away from water and dirt instead of in the basement.

Brighter and more uniform colors and elimination of dirt and pipe scale in the bath due to stainless steel construction.

Uniform pressure in all spindles due to elimination of pipe friction.

Saving in floor space due to self contained design.

Ease in unloading.

Ready accessibility of all parts.

Simplified installation. No special foundation is required, the machine simply resting on the floor. Make electric, steam and water connections and the machine is ready to operate.

No special winding equipment is required, since the machine will take any top.

Wide adaptability. Pressures are adequate for rayon and mohair tops, as well as for worsted.

Flexible design. The machine can be furnished with any length of spindle, any number of spindles (within reason) and any arrangement of spindles desired. A staggered spindle arrangement will effect maximum utility of kettle space and therefore the shortest possible dye bath.

The machine consists of a rectangular box to the bottom of which are attached the desired number of perforated spindles. At one end of the machine is located a vertical, motor driven, centrifugal pump securely fastened in place with eight stay bolts. The motor for this pump is set on top of the machine and attached to the pump with shaft and coupling. The pump chamber is separated from the main dye tank by means of a perforated screen, which is removable to afford easy access to the pump in case of repairs.

The dye liquor is drawn through this screen and pumped into a pressure chamber directly below the pump, thence through a distributing canal welded under the bottom and from there up through the perforated spindles, through the tops and out into the dye tank, from where the cycle is repeated. A cross section of the distributing canal is semi-circular in shape which makes for minimum flow resistance and the canal is provided with a drain pipe and hand valve on the outer end.

During the dyeing operation the tops are compressed and held in place by the conventional cap and bar arrangement common to this type of machine.

Unloading may be accomplished by means of a chain hoist fastened to the clamping bar, which in turn lifts all the tops in one operation with the aid of chains fastened to lifting plates under each column of tops.

Water is supplied through a pipe leading into the top of the pump chamber, while steam is introduced directly into the bath through a perforated pipe entering the side of the dyeing chamber near

the bottom and next to the perforated screen.

The machine is now performing in a highly satisfactory manner in a number of well-known mills.

• "EBONIZED" MONEL

Research engineers of the Huntington Works of The International Nickel Company, Inc., have produced "Ebonized" Monel with an ebony finish designed for use where appearance must be maintained under temperatures up to 1400° F.

The material is identical with standard Monel except that a lustrous "blue-black" finish is imparted in a specialized oxidizing operation. It has been created particularly for a newly designed heat deflector used in Chromalox super-speed range units manufactured by the Edwin L. Weigand Company.

Element pans, reflectors and deflectors in all electric heating units have been source for complaints because the materials from which they are made invariably suffer heat discoloration or stain and rust. It is stated that since this new ebonized metal like standard Monel possesses complete rust immunity and diversified resistance to corrosion in addition to its new ability to resist discoloration from relatively high temperatures, it helps provide insurance against costly replacements and unsightly appearance.

The deflector design is an interesting one. Until now, most heating units were equipped with *reflectors*—pans of bright materials that tended to reflect heat back up toward the unit. The deflector presumes the operation of a flue. It convects air currents that in turn transmit escaping heat back towards the middle of the element. In this manner the heat is intensified by the up-draft air currents directed by the design of the ebonized Monel deflector.

Tests by thermal experts are said to demonstrate that an improved efficiency is obtained with the unit.

• JOINS RICHARDS

L. S. Hirsch, formerly with B. P. Ducas Co., has joined the Richards Chemical Works, Warren and Morris Sts., Jersey City, N. J. His duties will include the production and sale of specialties such as sizing, softeners, cleaning compounds and penetrants to the textile, paper, tanning and metal and bottle cleaning trades. Mr. Hirsch goes to the Richards Company well prepared for he has had considerable experience in the field. He was with B. P. Ducas Co. from 1909 until the war in 1917; from 1919 to 1921 he worked in various capacities with the dyestuffs division of duPont; he rejoined the Ducas company in 1921 and became vice-president and manager in 1924. He

L. S. Hirsch

continued with them until September of this year.

• GENERAL RELEASES

General Dyestuffs Corp., 435 Hudson Street, New York, N. Y., has distributed circulars on the following products:—

Celliton Fast Blue F F R—an acetate dyestuff of an exceptionally clear reddish blue shade which is said to level well and to be very fast to light. Circular I. G. 1247.

Celliton Fast Yellow 7 G—which produces extremely clear yellow shades said to be of very good fastness to light; it is further said to be especially adapted for fast to light greens. Circular I.G. 1347.

Celliton Discharge Rubine B B F—which is said to be easily dischargeable to a clear white with Decroline Soluble Conc. It is further said to be very well suited for direct printing. Circular I.G. 1368.

Brilliant Indo Blue 5 G—a new acid dyestuff brought out by the I.G. and offered to the trade by General. Dyed from a Glauber's salt-acetic acid bath and exhausted with sulfuric acid, it produces bright greenish blues which are said to be distinguished from ordinary Patent Blues by their good fastness to washing, water, milling, perspiration and salt-water. Bright blues and, in combination with Milling Yellow H 5 G, greens for the knitting trade may be dyed, which, it is claimed, so far could not be obtained in this fastness to washing, etc. The good fastness to stoving is said to make the new brand of interest for blankets. It is stated that it is not affected much in shade by chroming and that it may be used to advantage for brightening dyeings with chrome colors. It is said to exhaust well from a neutral bath and to have good affinity for silk; also that wool-silk mixed fabrics are dyed a uniform shade. Circular I. G. 1297.

Celliton Discharge Pink B R F Extra—producing very fine bright pink shades, which, it is stated, are so far not obtainable and can be discharged to a pure white with Decroline Soluble Conc. Circular I.G. 1367.

Rapidogen Yellow I 4 G—General's brightest yellow, said to be of excellent fastness to light and very good fastness to washing and chlorine. It is claimed that this product is absolutely stable in the print paste and that besides being useful for application printing is also very satisfactory as a resist under Aniline Black or Algosols. Circular I.G. 1382.

Ethyl Acid Violet 4 B Conc.—a new acid dyestuff manufactured by General Aniline Works and offered to the trade by General Dyestuff. It is said to dye very level from a Glauber's salt-sulfuric acid bath and on account of its high tinctorial strength is especially recommended by the manufacturers in combination with Acid Greens, for the production of cheap Navy Blues for which no special fastness is required. It is said to leave effect threads of cotton, rayon or acetate very clean. Circular G-163.

Rapidazol Navy Blue R 6-R—which can be developed by neutral steaming and produces reddish navy blues said to be of good fastness to light and very good fastness to washing. Circular I.G. 1370.

Rapidazol Navy Blue G—supplementing the Rapidazol range, which represents Naphtol types which can be printed in neutral steam alongside Vat colors; the product will produce a greenish Navy said to be of very good fastness to light and washing and satisfactory fastness to chlorine. Circular I.G. 1369.

• DYESTUFFS

Among the contents of *Dyestuffs* for September, quarterly publication of the National Aniline & Chemical Co., 40 Rector Street, New York, N. Y., are articles described by the following titles: National Nacconols, the New Surface Active Agents; Men and Women's Shoe and Leather Colors for Spring, 1938; Fulling and Napping of Rayon-Woolen Blends, by David Welsh; Control of the Waste Water in the Textile Finishing Industry; The Processing of Pig Bristles by G. Furlonger; The Underlying Cause of Tarnished Prints by William Paz Brunson; The Dyeing of Recovered Wool; Coating with Acetate by John H. Lepperhoff and The Bleaching of Straw (concluded from the June issue). Copies of *Dyestuffs* are available upon request.

• QUARTERLY PRICE LIST

The Quarterly Price List for October, 1937, has recently been distributed by the R & H Chemicals Dept. of E. I. duPont de Nemours & Co., Inc., Wilmington, Del. Copies are available upon request.

• U. S. TECHNICAL BULLETIN

Technical Bulletin No. 588, U. S. Department of Agriculture, has recently

been published. It is entitled "The Sterilization of Wool and Its Effect on Physical and Chemical Properties of a Wool Fabric" and was prepared by Harry Humfield, associate bacteriologist, Division of Soil Microbiology, Bureau of Plant Industry; Ruth E. Elmquist, associate textile chemist, and James H. Kettering, junior chemist, Textiles and Clothing Division, Bureau of Home Economics. The Bulletin is for sale by the Superintendent of Document, Washington, D. C., at 5c per copy.

• ADDRESSES BASKERVILLE ASSOCIATION

Dr. Edward W. Norris, vice president and technical director of John Campbell & Co., delivered an address before the Baskerville Association, Graduate Chemists of City College of New York, on Friday evening, October 22nd. His address was entitled "The Romance of Dyestuffs" and was augmented by demonstrations.

He developed his subject historically recalling that one of the first mentions of dyes occurs in the biblical account of Joseph's coat of many color, the discovery of benzene in coal tar by Hoffman, Perkins synthesis of mauve, Kekule's hypothesis of a ring system for benzene, discovery of the azo compounds by Griess, Boettiger's discovery of benzidene and so on through the development of colors for acetate.

• CHEMICAL EXPOSITION

Outstanding exhibits of leading chemical manufacturers will feature the 16th Exposition of Chemical Industries to be held at Grand Central Palace, New York City, December 6-11, 1937. Indications in advance of the opening reveal a spirit of enthusiasm and comprehensive effort in exhibit planning on the part of many of the most representative concerns in the United States.

• WARWICK SOUTHERN PLANT

Mr. Ernest Nathan, President of the Warwick Chemical Company of West Warwick, R. I., and 580 Fifth Avenue, New York, announces the purchase of a manufacturing property in Rock Hill, S. C., from the Highland Park Mfg. Company. Warwick will remodel and equip the plant with modern machinery for the manufacture of textile chemicals, in order to be in a position to give better service to their Southern customers.

The new plant will be known as Carolina Division of Warwick Chemical Company and will be in charge of Mr. M. M. McCann, who already for two years has been one of Warwick's Southern representatives, following his long connection with Burlington Mills.

Mr. W. E. H. Searcy, 3rd of Griffin, Georgia, will continue to represent Warwick's interest in the Georgia-Alabama territory.

• NEW PROGRESSIVE JIG

This machine is manufactured by Riggs and Lombard, Inc., of Lowell, Mass. and has been in successful operation in a well-known southern bleachery for more than a year.

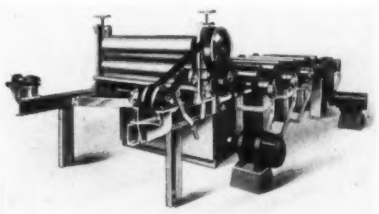
It was designed for open width boiling off, bleaching or dyeing of heavy cotton fabrics, such as collar cloth, gabardines, heavy drills, twills, ducks, etc., which should not be roped up in a kier where they would be permanently creased.

This machine liberates dye jigs, for other purposes, which would ordinarily be used in its place and involves a smaller investment than a group of dye jigs with the same capacity. It also conserves chemicals, since it squeezes excess liquor back into the bath after processing. It is regularly built with one long open compartment, although it can be built with a series of compartments for a sequence of treatments if desired.

The goods enter the machine in the original dry state, the average batch being about 1000 yards, where they are rolled progressively on to a series of 6 cylinders. When a cylinder is completely loaded it is about 40" in diameter and the lower half of it rotates in the bath at all times.

As soon as a batch of 1000 yards is completely wound on to the first cylinder it is then rewound to the second cylinder and thence to the third, fourth, fifth and sixth. Last of all it passes through a pair of squeeze rolls to the slip belt batcher or swing as the case may be.

Each cylinder is provided with a spring loaded clamping bar to hold the front end of the fabric, also with a clutch so that it can be cut in and out of production at will. When a cylinder is unwinding its clutch is disengaged and suitable tension is provided with a brake.



Since there are six cylinders on the machine and since each batch of cloth involves 2 cylinders it is evident that the maximum capacity of the machine is 3 full batches or 3000 yards at one time.

The cylinders are motor driven through sprockets, chains and clutches, while the squeeze rolls are provided with a separate motor. A drain valve is located at the front of the machine.

The kier is made of boiler steel when used for caustic and of stainless steel when used for bleaching or dyeing.

• HERCULES SPLITS STOCK

Stockholders of Hercules Powder Company at a special meeting on November 4, 1937, approved the split up of the company's stock into twice as many shares.

The split up will be effected by issuing on November 23, 1937, to each stockholder of record at the close of business on November 12, 1937, one additional share of common stock for each share held on the record date.

• DU PONT EXHIBITION

An important feature of the Du Pont Exhibition, which opened at the Franklin Institute on October 13th, and will continue for several months, was the Rayon Salon which included an educational display of modern rayon fabrics, and also a showing of Cordura, the new rayon yarn which, used in the quadrilateral jib of the racing yacht "Ranger," is said to have contributed largely to her success in the recent America's Cup races. Also shown was a display of "Lucite" plastic, the new crystal clear plastic recently announced by the Du Pont Company.

In the Rayon Salon textiles from the leading style weavers form an elaborate display, covering a complete range of fabric types. Cascades of fabrics from the high ceilinged building cover the entire wall sides of the salon. This textile display, while presenting the important new weaves, is a part of the scientific story of rayon production and progress, with each fabric exemplifying such developments as the various thicknesses of yarn ranging from very fine to very coarse diameters, the bright, dull, and semi-dull rayons, spun rayons, "Thick and Thin."

Chosen from the current collections of style fabric houses are weaves which show modern trends in texture and surface for apparel and home decoration. In the group of fashion fabrics are the new, crisp worsted types of spun rayon, armure sheers, bengalines, clokys, alpacas, fine crepe jerseys, "Thick and Thin" surface crepes and satins, and a variety of other types. The new upholstery and drapery textiles, especially featuring spun rayon, include friezes in upholstery fabrics, moires, embroidered curtain gauzes, brocades, hand etched prints, antique satins and others.

Focal point of the Rayon Salon is a large photographic mural showing in successive scenes the story of rayon. In these pictures, rayon is carried from its beginning, in the spruce forests and

cotton fields, to the high lights of its manufacture and spinning, and thence to new rayon fabrics and their application in high fashion dresses and the rooms of modern homes.

Framing the mural on either side are twin fountains composed entirely of strands of rayon yarn in graduated size and softly illuminiated in rainbow colors.

Near the entrance to the Salon are exhibits showing various rayon yarns and examples of fabrics in which they appear, including Du Pont Rayon Thick and Thin yarn, spun rayon yarn, Cordura, and heavy yarns contrasted with very fine filaments. Spinnerettes, from which the finished yarn emerges in various sizes, are also shown.

In the variety of fabrics draped along the walls of the Salon, the play of vivid colors against delicate pastels; of clear white on black, illustrate the ability of rayon to take colors clearly and evenly.

At specified times a talk is given on the subject of rayon. Other features of the Du Pont Exhibit including lectures and demonstrations of certain of its diversified chemical products, include neoprene, dyestuffs, bleaching agents, water-repellent finishes, crease-resistant finishes, soapless soaps, and various other developments. The motion picture, "The Wonder World of Chemistry" is shown.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Unanswered Question

41—We would like to know the general principles of the process used in rendering silk transparent. Inasmuch as the process is to be used on rather heavy goods, we believe that one of the newer methods whereby thin layers of fiber have been rendered absolutely transparent is necessary. Information along this line which any of your readers are inclined to give will be highly appreciated.—**Library.**

New Questions

42—We understand that trisodium phosphate and caustic soda are used for saponifying acetate rayon for printing. Results by this method however are not always satisfactory. We would like information as to how acetate rayon for printing can best be saponified or treated so that it will take direct cotton dyes or developed colors. Information upon this subject will be appreciated.—**W. G.**

43—We are looking for a tarnish proof finish for tinsel. Any information on the subject will be appreciated.—**R. C. C.**

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Chemist—graduate Lowell Textile, experienced, young, seeks position. Prefers field as research or control chemist in sulfonated oils or textile chemicals. Salary secondary. Knowledge German. Write Box No. 983, American Dyestuff Reporter, 440 Fourth Ave., New York, New York.

POSITION WANTED: As dyer of acetates, jig work and boxes. Varied experience in all types of dyeing. Prefers New York locality but will go anywhere. Write Box No. 988, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: University graduate chemist, age 27, now employed as dyer of acetates and rayons, laboratory and plant experience, analysis dyestuff testing, boil-off. Have good references. Write Box No. 989, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: TEXTILE CHEMIST with mill and sales experience. Good opportunity with a leading starch manufacturer. State age, experience, salary expected. Write Box No. 990, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Colorist-Chemist-Dyer; 9 years' experience dyeing and processing rayon, acetate-rayon, silk-Bemberg, weighted and pure dye silks. Excellent record in reducing dyeing costs. Formula dyeing and scientific control. College graduate; married. Territory immaterial. Write Box No. 991, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WANTED: Side line salesman by well known manufacturer of Dye Nets, Canvas Bags and other Hosiery Mill Specialties for Georgia, Alabama, and Tennessee; straight commission, some established business. Write Box No. 992, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.